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IBC Blanket Coating System

IBC

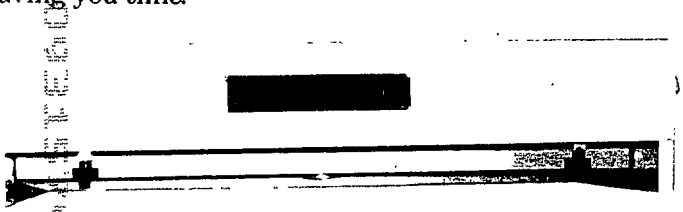
When you want the full-line on in-line, talk to IBC.

We urge you to look closely into a "first." The IBC Blanket Coating System. It is the first blanket coating system to efficiently apply today's coatings *in-line.*

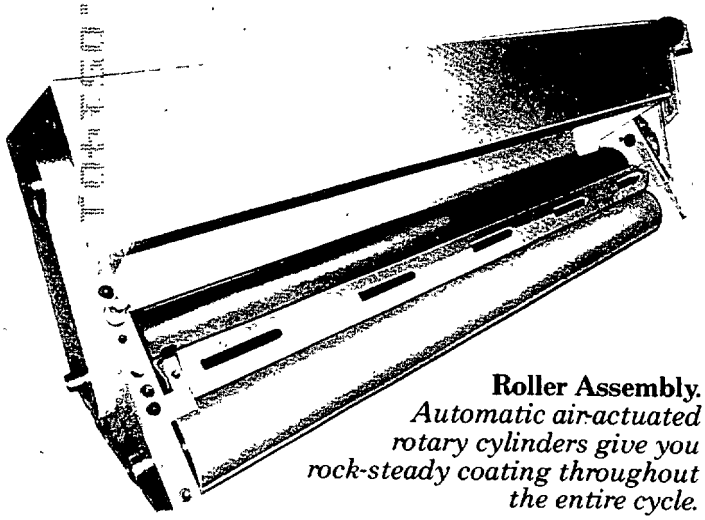
Its major components consist of a blanket coater with recirculating tank and a shortwave infrared dryer. It adapts to almost any sheetfed press, any make, in any size from 18 to 77 inches.

It is also the only in-line system with a retractor unit. The retractor lets you automatically change from printing to coating, and vice versa, in a matter of minutes.

The IBC System is a real timesaver in several ways. No plate mounting is ever called for, which of course means no plate washing on trip-offs either. Thirty-minute make-readies are the rule, not the exception. And the IBC System comes with its own blanket washer that can be manually operated to wet the blanket; or it can be set to automatically wash the blanket on trip-offs - again saving you time.

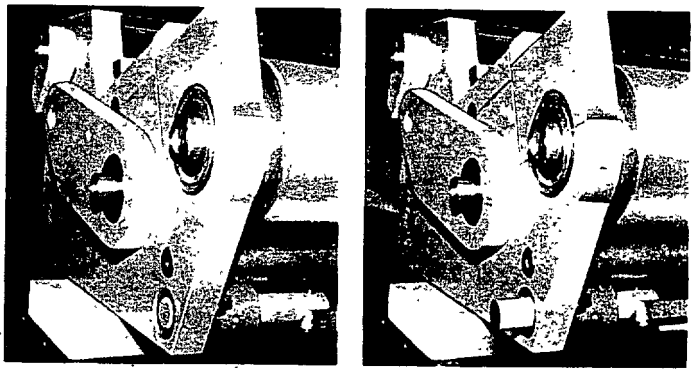


Coater Unit. *Easily retracts from the press and re-connects with all settings fully retained.*

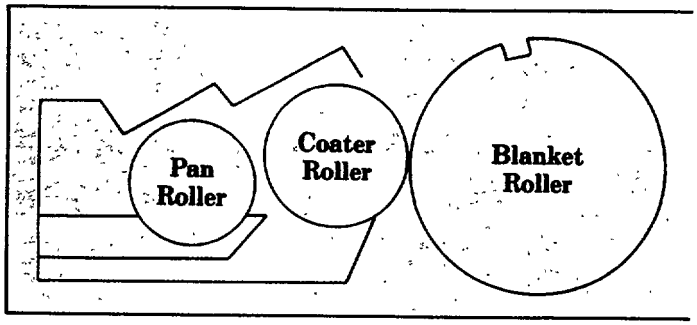


Roller Assembly. *Automatic air-actuated rotary cylinders give you rock-steady coating throughout the entire cycle.*

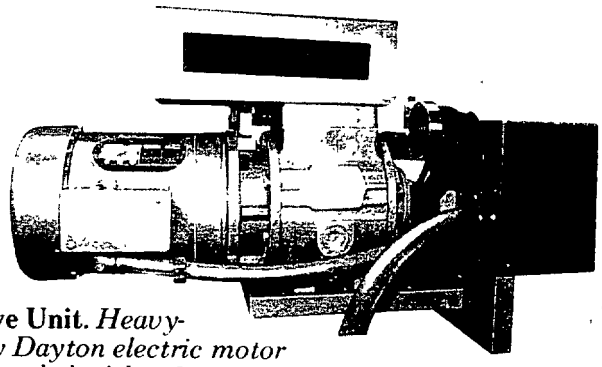
The IBC System's coater roller (composed of a harder-than-steel ceramic material) is driven by a variable-speed, constant-torque transmission. It allows you to run the coater roller up to 25% slower than the blanket cyclinder. Any ridging is eliminated. You get a super smooth coating.



Easy Operation. *Automatic air actuated engages the coater unit to the press. Photo at left shows pins disengaged.*

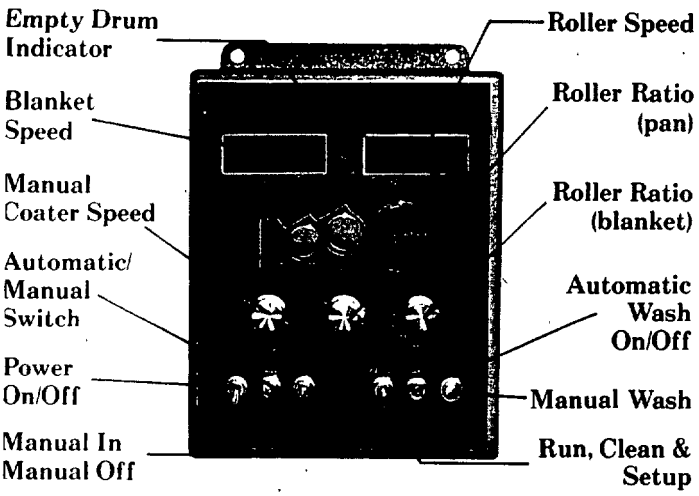


Simple Mechanics. *Once the press is tripped, the coater automatically withdraws and goes into an idle mode keeping the rollers wet.*



Drive Unit. *Heavy-duty Dayton electric motor is coupled with a durable, high torque transmission.*

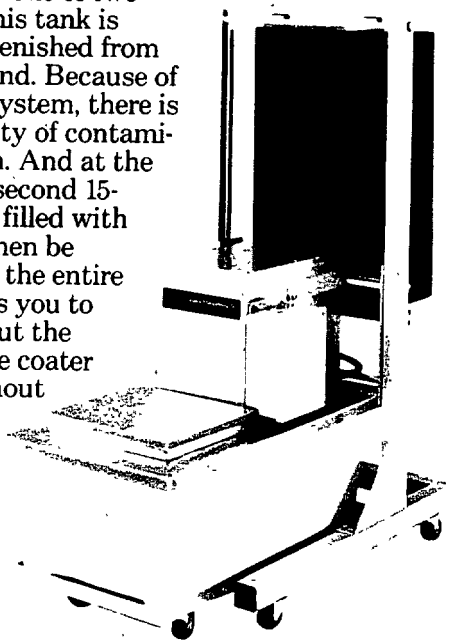
Constant operating speeds are maintained by the heavy-duty Dayton electric motor. And you get positive power through all speed ranges, because the motor is directly linked to the high-torque transmission. No DC belt-drive, like on most other coaters. All you do is set up the initial roller speed from the control panel, and then fine-tune as you run. Faster, slower, whatever speed you set, the coater will follow automatically.



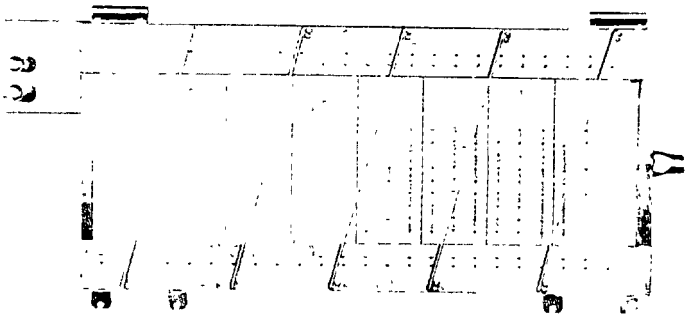
Control Panel. *Gives you infinite speed control and two wash-up options.*

Easy-to-read LCD displays on the control panel tell you how fast the coater roller and blanket cylinder are running; also, the control panel is easy-to-reach, conveniently located on the operators side of the p[illegible] at the coater position.

The IBC System is also equipped with a recirculating tank unit. It is this component of the system that continuously replenishes the coater via flexible plastic hoses connected to one of two 15-gallon tanks. This tank is automatically replenished from the drum on demand. Because of this replenishing system, there is never any possibility of contamination to the drum. And at the end of each run, a second 15-gallon tank can be filled with water, which can then be circulated through the entire system. This allows you to thoroughly flush out the recirculator and the coater automatically without ever having to change the solution in the first tank.

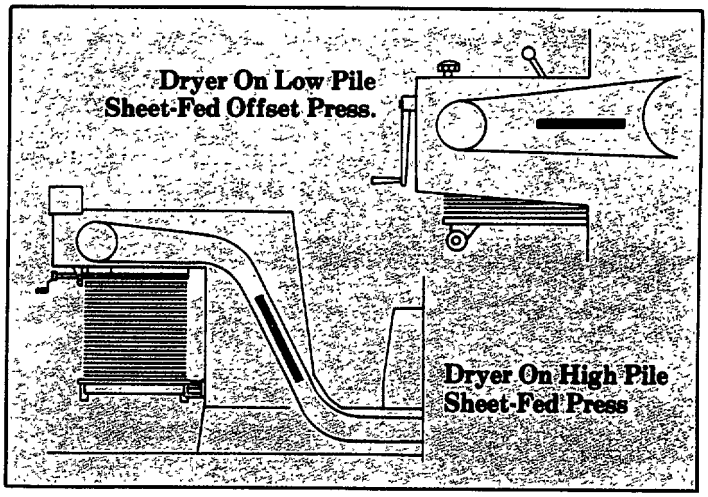


Recirculating Tank Unit. *Sets on wheels, so you can place it anywhere near the coater and still keep it out of the way.*



Infrared Dryer. *Safe, shortwave infrared energy is emitted from high-efficiency, low-mass, tubular quartz lamps.*

All IBC Infrared Dryers are custom-designed to fit specific presses for specific applications. Consequently, an IBC dryer can be installed on virtually all high-pile or low-pile sheetfed offset presses. No major press modifications are ever needed.



IBC Dryers, installed. *The IBC Infrared Dryer can be mounted parallel to the direction of sheet travel, between the gripper chains.*

Because of the lamps low mass, they reach operating temperature almost immediately and cool down equally as fast. Whenever the IBC dryer is on, an air supply system delivers a flow of cooling air across the lamp terminals to keep them cool. A thermostat inside the dryer's frame monitors the temperature and automatically shuts off the dryer if the temperature (for whatever reason) rises too high. Each IBC dryer comes with an air knife bar for drying aqueous coatings. Optional dryer equipment includes a water-cooled reflection pan and sheet cleaners for some presses.

Aquacoat™ Water-Based Coating

Bring high-gloss beauty to your printing with Aquacoat™ water-based coating.

It gives paper and paperboard a good moisture-barrier, high grease-resistance and superior rub characteristsics. Yet, it has no effect on the important paper qualities, such as color, strength or flexibility. And it is also bio-degradeable.

Aquacoat coating is permanent and fast drying. Apply it wet-on-wet or on dry ink. It is also glueable, imprintable, and can be price marked.

Aquacoat coating keeps packages clean and protects them from abrasion through finishing, packing, shipping, storage – all the way to the point-of-purchase. And even while the customer uses it, the product stays clean and fresh-looking.

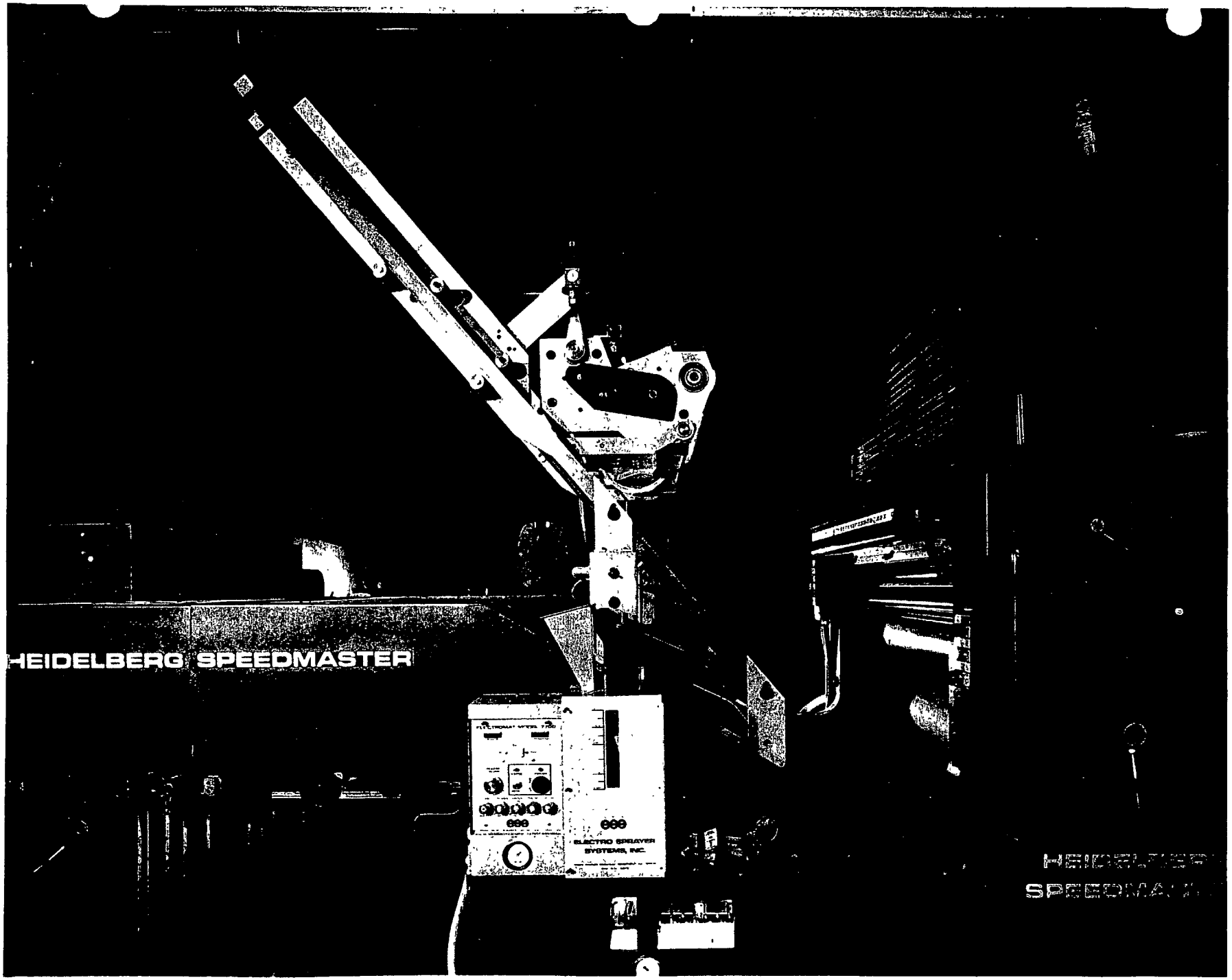
Use Aquacoat water-based coating for cartons, trays, bags, labels, coupons, wraps, laminates, brochures and covers.

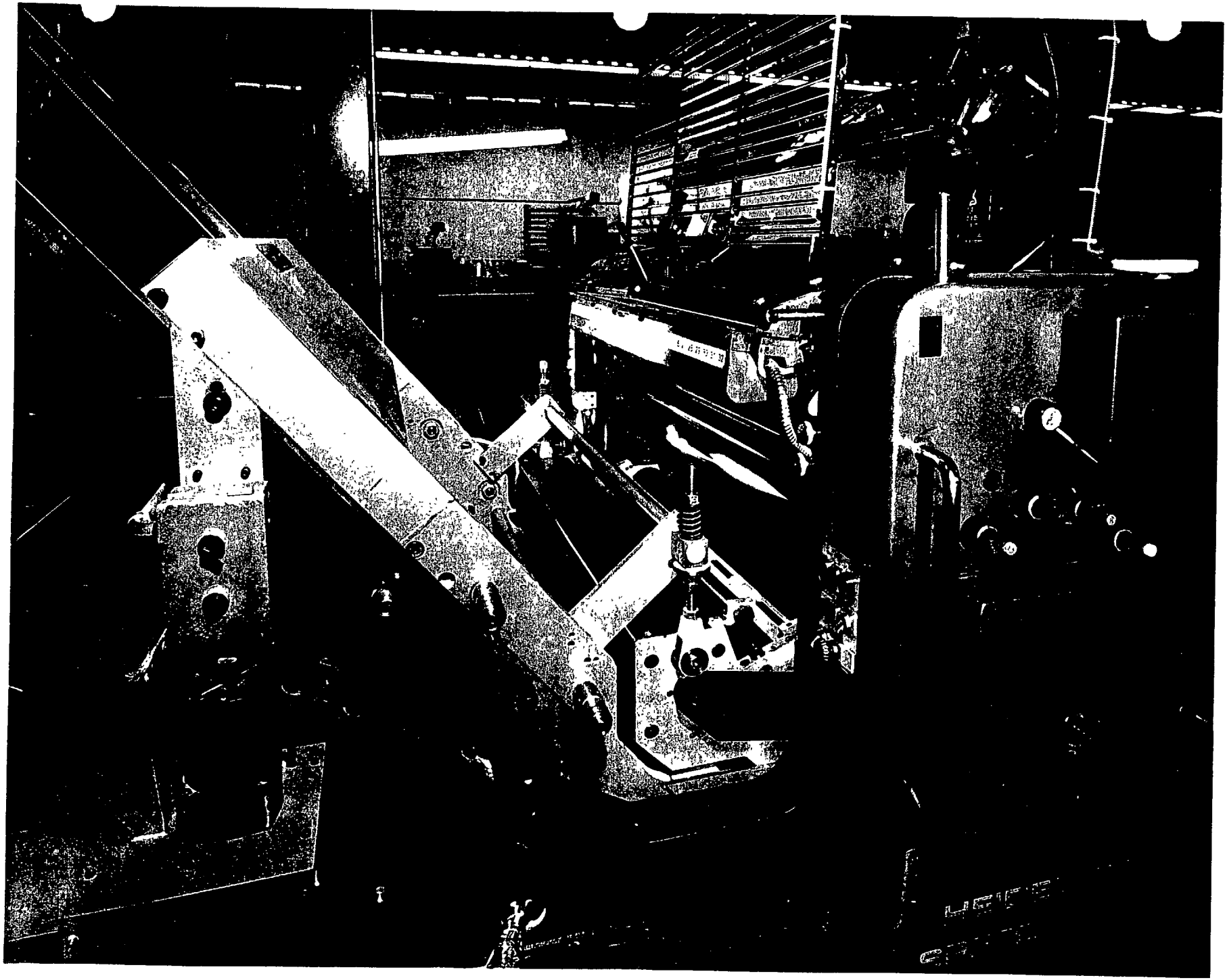
If you'd like to know more about Aquacoat coating or our full-line of in-line blanket coating components, please call us.

We'd be happy to hear from you.

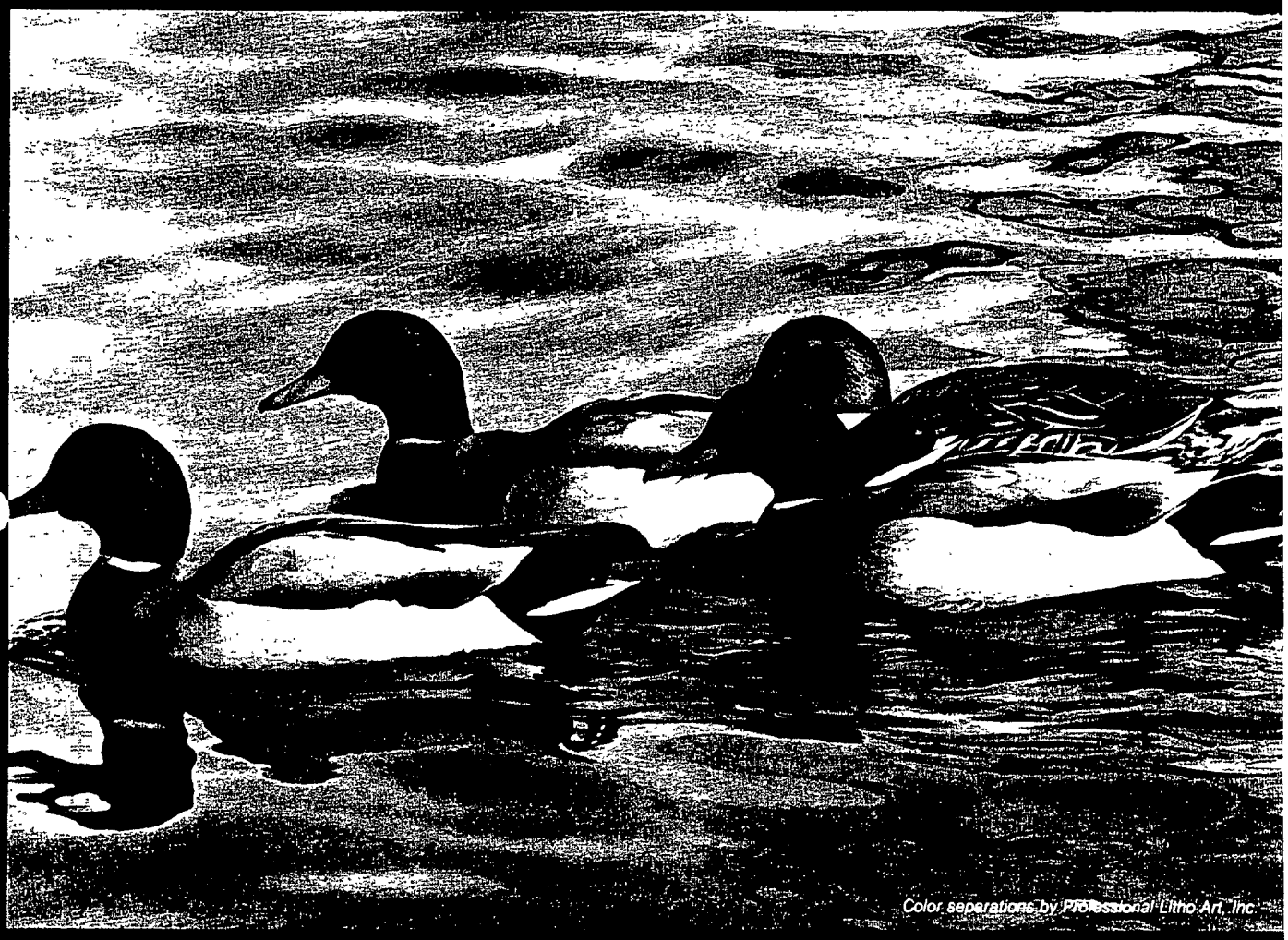
IBC
INTERNATIONAL BLENDING CORPORATION
8090 Ranchers Road • Minneapolis, Minnesota 55432 • Phone: 612/780-5377

Printed in USA


HEIDELBERG SPEEDMASTER
ELECTRO SPRAYER SYSTEMS, INC.



AQUACOAT™

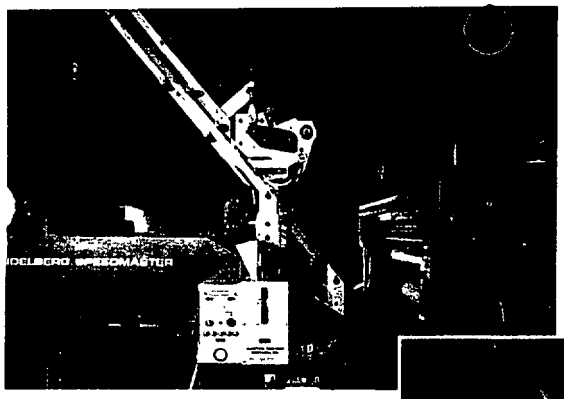


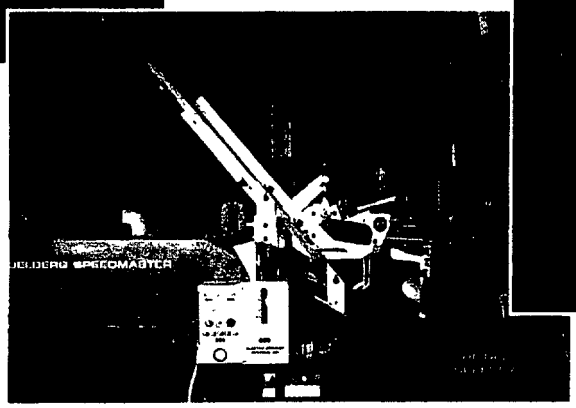
Color seperations by Professional Litho Art, Inc.

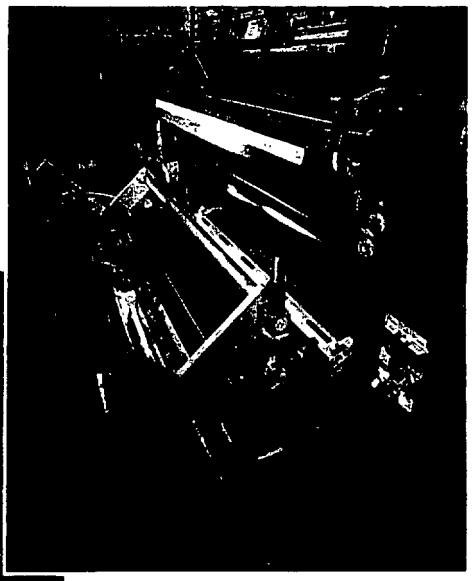
What you see is beautifully protected by Aquacoat.™ To see how it was applied in-line, just turn the page.

IBC

Artist: Tom Gross, "Mating Mallards"
Ask for details on how you can receive a signed proof of this award winning art, "Mating Mallards".







Come to IBC— the Coating Systems People.

The IBC/Ryco Graphic In-Line Blanket Coater

IBC/Ryco Graphic is the first—the first blanket coating system to efficiently apply today's coatings *in-line*.

You can install the IBC system on almost any press, any make, from 18 to 77 inches. When you're not coating, simply retract the coater for easy access to the blanket cylinder.

The independently driven pan roller and coater roller can be fine tuned to run faster, slower, or the same speed as the blanket cylinder. An LED display tells you how fast the coater roller is running; once it's set, the coater will always follow press speed.

A 15-gal. recirculating tank continuously replenishes the coater. Because the tank unit sets on wheels, you can place it anywhere near the coater and still keep it out of the way. In fact, you get an extra tank with the system, so you can flush out the press and the system without changing solution in your coating tank. (Its low profile lets you mount the coater on any high-low offset press.)

No plate mounting is necessary with the in-line IBC/Ryco—in fact, ten-minute make-readies make the IBC/Ryco Graphic Blanket Coater a real time saver compared to others. It comes with its own blanket washer that automatically washes the blanket on trip-offs—again saving you time.

IBC Infrared Drying Equipment

The IBC Dryers are manufactured to exacting engineering specifications to perform well with the IBC Coating System. The dryer comes equipped with an air knife bar necessary for drying aqueous coatings. The IBC Dryer uses air cooling and thermostats to protect both the dryer and the press it is mounted on. IBC offers a water cooled reflection pan if desired. IBC also offers sheet cleaners for some presses.

Printed and coated by Jet Press, Inc., Downers Grove, Ill., on a 40" 6/C press with an IBC Coating System.

Aquacoat™ Water-Based Coating

You can bring high-gloss beauty to your printing with Aquacoat™.

Aquacoat™ gives paper and paperboard a good moisture-barrier, high grease resistance, superior rub characteristics and is non-yellowing. Yet, it has no effect on the important paper qualities of color, strength or flexibility.

Aquacoat™ is permanent and fast-drying—apply it wet-on-wet or on dry ink. It's also glueable, imprintable and can be price marked. Uses include cartons, trays, bags, labels, coupons, wraps, laminates, brochure and covers.

Aquacoat™ keeps packages clean and protects them from abrasion through finishing, packing, shipment, storage, all the way to the point-of-purchase. And even while the customer uses it, the product stays clean and fresh-looking.

Yes, tell me more!

Send me more information about the:

- ☐ Aquacoat™ Water-Based Coating
- ☐ Ryco In-Line Graphic Blanket Coater
- ☐ IBC Dryer
- ☐ I am interested in the total IBC System.
- ☐ Please have your sales representative call me

Name _____ Title _____

Company _____

Address _____

City _____ State ____ Zip _____

Phone _____

Press Size _____

Write to:

International Blending Corporation

IBC

8090 Ranchers Road
Minneapolis, MN 55432
Phone: 612/780-5377

RYCO GRAPHIC MANUFACTURING, INC.

ROLLER COATER

SET-UP PROCEDURE

COATER

SET-UP PROCEDURE

1) Put coater rack in down position & lock by pushing.

2) Push down button, making sure coater air cylinder rods clear coater safety rack.

3) Be sure coater sets on wheels when contacting rails. First release front hoist hooks & move up out of way. Lower coater more until back hooks are free. Hold back hooks away and put hoist up at top. Hold up button until hoist stops.

4) Push coater into press: both sides equally. Be sure air cylinder shafts contact top 2" diameter bar. Put top of clamp blocks on. Reach under coater with tool & lock pins into frame brackets. Tighten clamp blocks by turning screws and drawing air shaft rods up. (Placing control on manual & set-up, then pushing & holding out switch will aid in tightening clamps.)
NOTE: *** Keep fingers clear when holding switch!!!

5) Put stand tube in pan, drum fill tube in drum, and return from recirculator in recirculator. Open lid. Turn green switch on to start recirculator.
NOTE: *** Power switch on coater control must be on and also run switch must be in set-up position.
Open fill valve on supply tube at coater.

6) When coating is flowing into drain in pan, put control from set-up into run position.

7) Adjust pan roller screw counter-clockwise evenly on both sides until coating on main roller is very thin but wet.

8) Put unit of press with coater on impression.
NOTE: Make sure coater control is switched to manual position before moving press.

9) NOTE: When packing blanket, be sure packing is cut to just inside sheet, about 1/8" each side.

10) Stripe blanket by setting run switch first to set-up and wait until roller stops. Then move in/out switch to in & hold for a second. Then release and hold out, release. Then return to run position. Move blanket cylinder around to inspect stripe.

11) If stripe is about 1/4" wide & wet all across, then run about 25 test sheets with press running slow. (see running)

IF STRIPE IS:	REMEDY
NOT SEEN (See Stop Block Adjustment)	Back out stop block adjustment (1) turn at a time, both sides equally.
HEAVY ONE SIDE (1/2" WIDE) NOT SEEN ON OTHER SIDE (See Stop Block Adjustment)	Back adjustment out on side with no coating and put (2) turns in on other.

IF STRIPE IS:	REMEDY:
1/2" WIDE ALL ACROSS (See Stop Block Adjustment)	Turn adjustment screws in (2) turns, both sides equally. (See Run)

12) Stop Block Adjustment:
Loosen top allen screw. Then turn large bolt in (clockwise) or out, depending on condition.
NOTE: Before re-testing, top allen screw must be very tight.

Each full turn of large bolt equals .010 of an inch movement of coater to blanket contact.

13) Running:
NOTE: When testing, take press unit off impression before putting coater control on Auto for Running.

14) When running, put coater roller #1 knob (center knob) at (1) at right of zero (0) to start. Set pan roller on (2) to keep coating circulation in NIP.

15) NOTE: Turn control knob for roller #1 (center knob) up to (2) or (3) if more coating is desired or gripper edge of sheet coating looks dragged or scuffed, about 1/4" back all across.

16) Clean-Up:
Pull stand pipe out, turn valve on fill tube off, take fill pipe out of coating from coating barrel, and return hose from recirculator. Put into coating drum. Then open grey valve.

17) VERY IMPORTANT:
Turn control for coater to clean position and immediately wet both coater rollers. Turn pan roller screws clockwise to back roller, away from main roller, about 6 turns, evenly both sides. With wet folded cloths, wipe full length very fast to pick-up any excess coating still on rollers.

18) VERY IMPORTANT:
Through entire clean-up, keep grey roller end plates wet with water (side against rollers), thus cleaning without removal.

19) Push whatever coating left in pan toward drain.

20) When recirculator has pumped all but about 1" of coating out of tub back into drum, remove tub and clean. Replace second tub with water--no more than 1/2 full.

21) VERY IMPORTANT:
Remove hose and barrel tube from drum and put into open lid in recirculator. Turn green switch on and let water pump through hoses for a couple of minutes. Turn grey valve off on recirculator hose. This will pump water up to the coater when supply tube valve on coater is opened.

22) VERY IMPORTANT:
Wash excess coating off everything with this water very completely. Then repeat this procedure with (2) more tubs of water. On last tub, turn valves off and leave recirculator setting in water.

23) VERY IMPORTANT:
Open lid on recirculator & see black or yellow looking tube on right. This is an electronic eye to keep coating at a pre-set level in tub. Bottom must not be scratched and must be very clean to work. Wash only with water and dry bottom after every use.
NOTE: Do not let eye sit in water-----about 1" below is fine.

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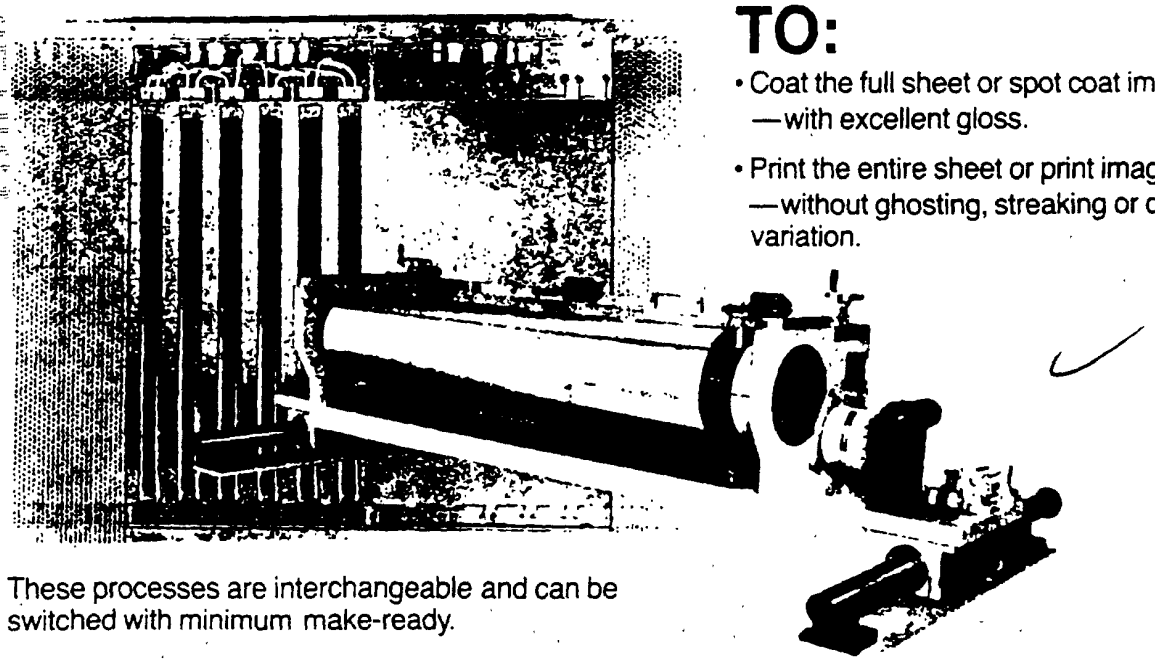
135 Line
11X17

DAHLGREN

COATER PRINTER

Two Processes In One!

The Dahlgren Coater/Printer is used in conjunction with the last printing station on a sheet-fed press.

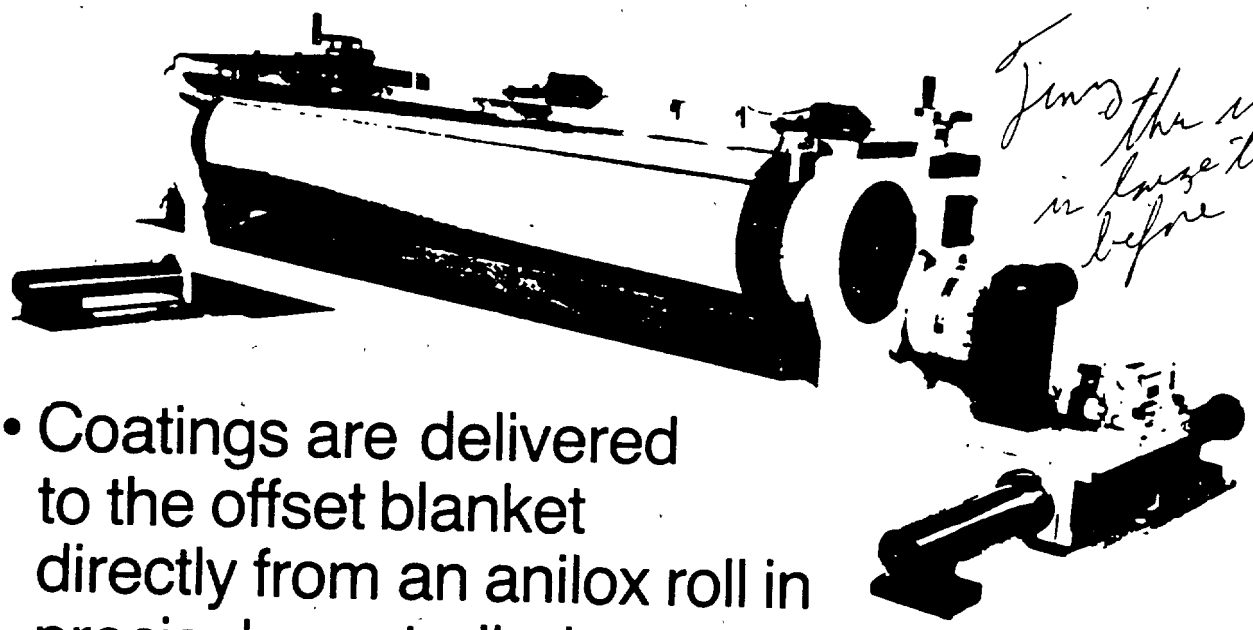


TO:

- Coat the full sheet or spot coat images —with excellent gloss.
- Print the entire sheet or print images —without ghosting, streaking or color variation.

These processes are interchangeable and can be switched with minimum make-ready.

The Coating Process:



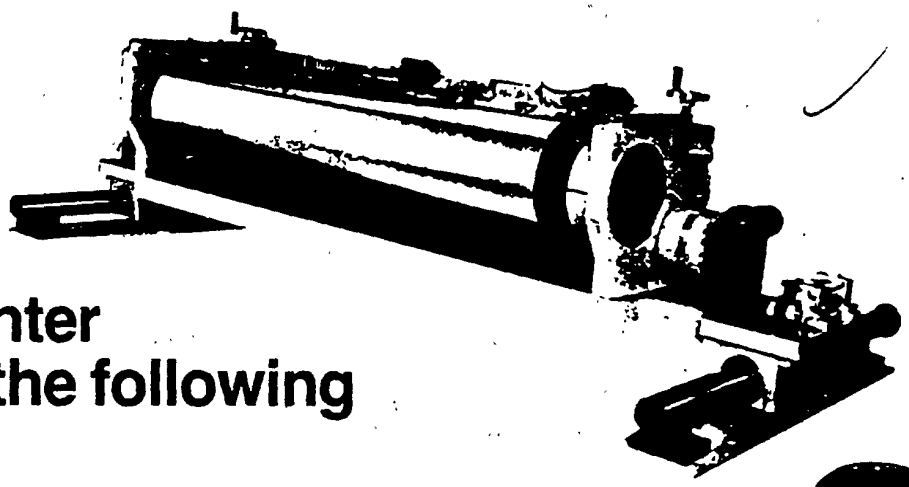
- Coatings are delivered to the offset blanket directly from an anilox roll in precisely controlled amounts and then transferred to the substrate with a high level of uniformity and consistency. It applies protective, high gloss and blister seal coatings over wet or dry surfaces with optimum efficiency.

- Various types of coatings can be used interchangeably with the Coater including aqueous and U.V. curables. Substrates of varying nature such as paperboard and plastics may also be used. Various combinations can be tested in Dahlgren's application lab to determine feasibility.

The Printing Process:

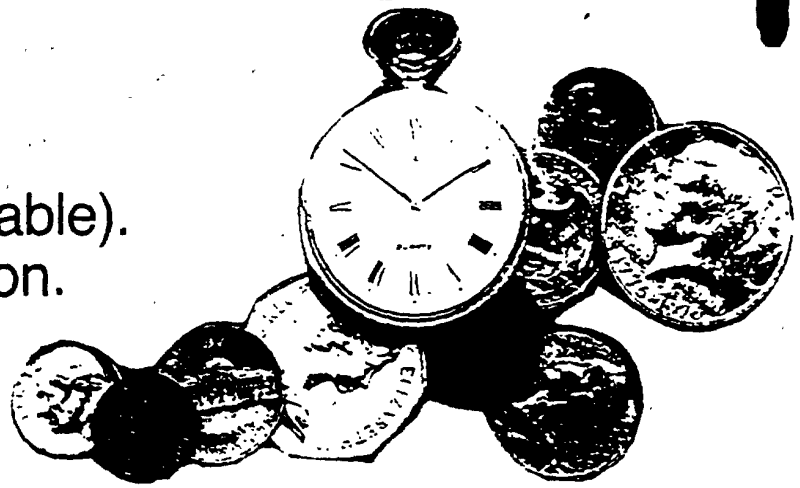
We are coating with color —with fantastic results!

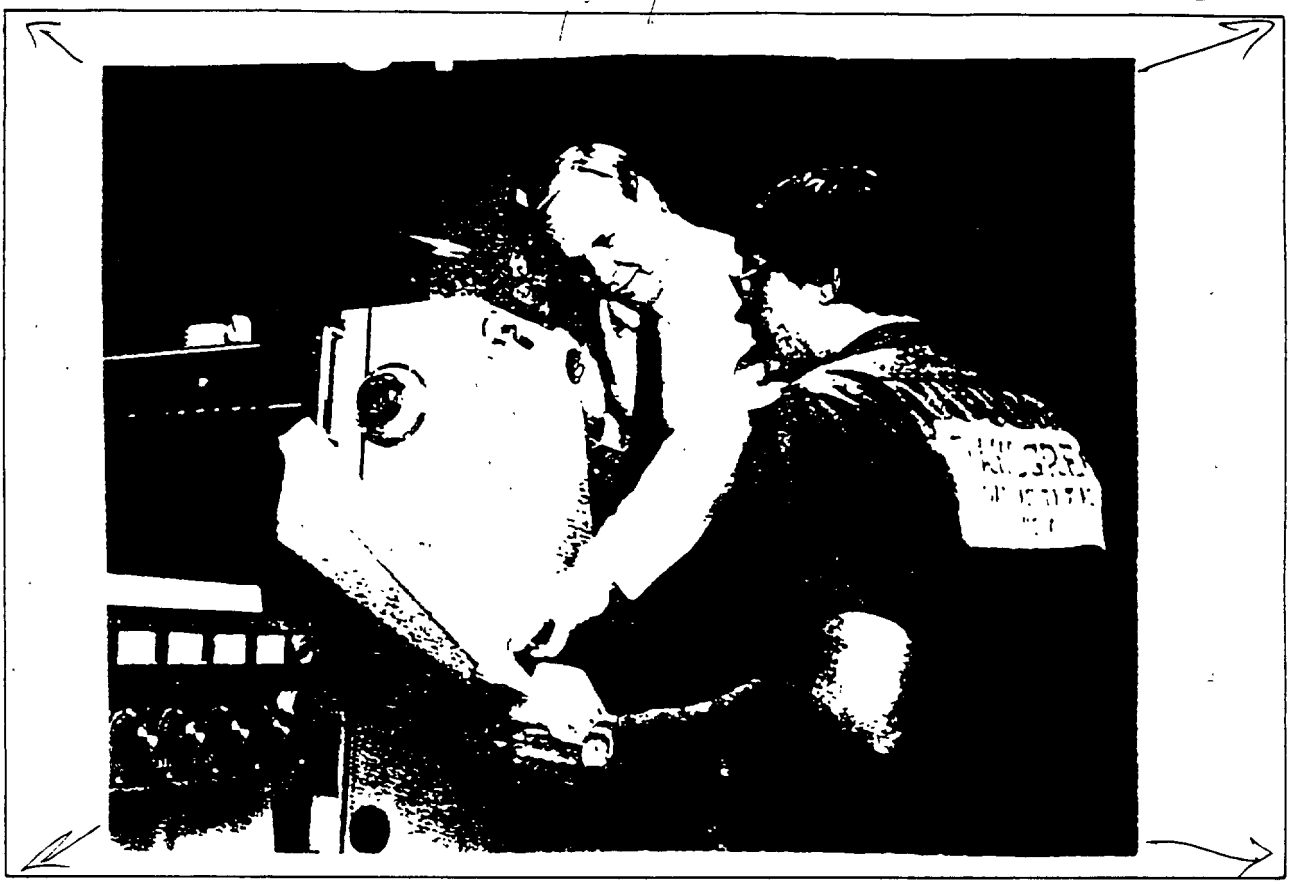
We're printing from a raised image resilient photopolymer plate. A doctor blade meters a continuous supply of ink to the anilox roll and plate with every revolution—*Totally* eliminating ghosting.



The Coater/Printer gives you the following benefits:

- Ghost-free printing.
- Smoother ink lay.
- Consistent and constant color.
- Immediate response produces instant color.
- Same color front-to-back and side-to-side.
- Drier printing.
- Runs *true* fluorescent and metallic inks.
- No hickeys.
- No ink keys.
- No color waste (3rd sheet saleable).
- No emulsification.





Dahlgren, the leader in technology and performance.

For the past three years Dahlgren has been expanding its products and services to service the changing needs of the commercial printer. The Coater/Printer evidences this commitment.

For all of the details on this remarkable new piece of equipment, contact your Dahlgren representative.

COATER dP PRINTER

DAHLGREN®

TECHNOLOGY/PERFORMANCE

Dahlgren International 3305 Manor Way
Dallas, Texas 75235 214/357-4621

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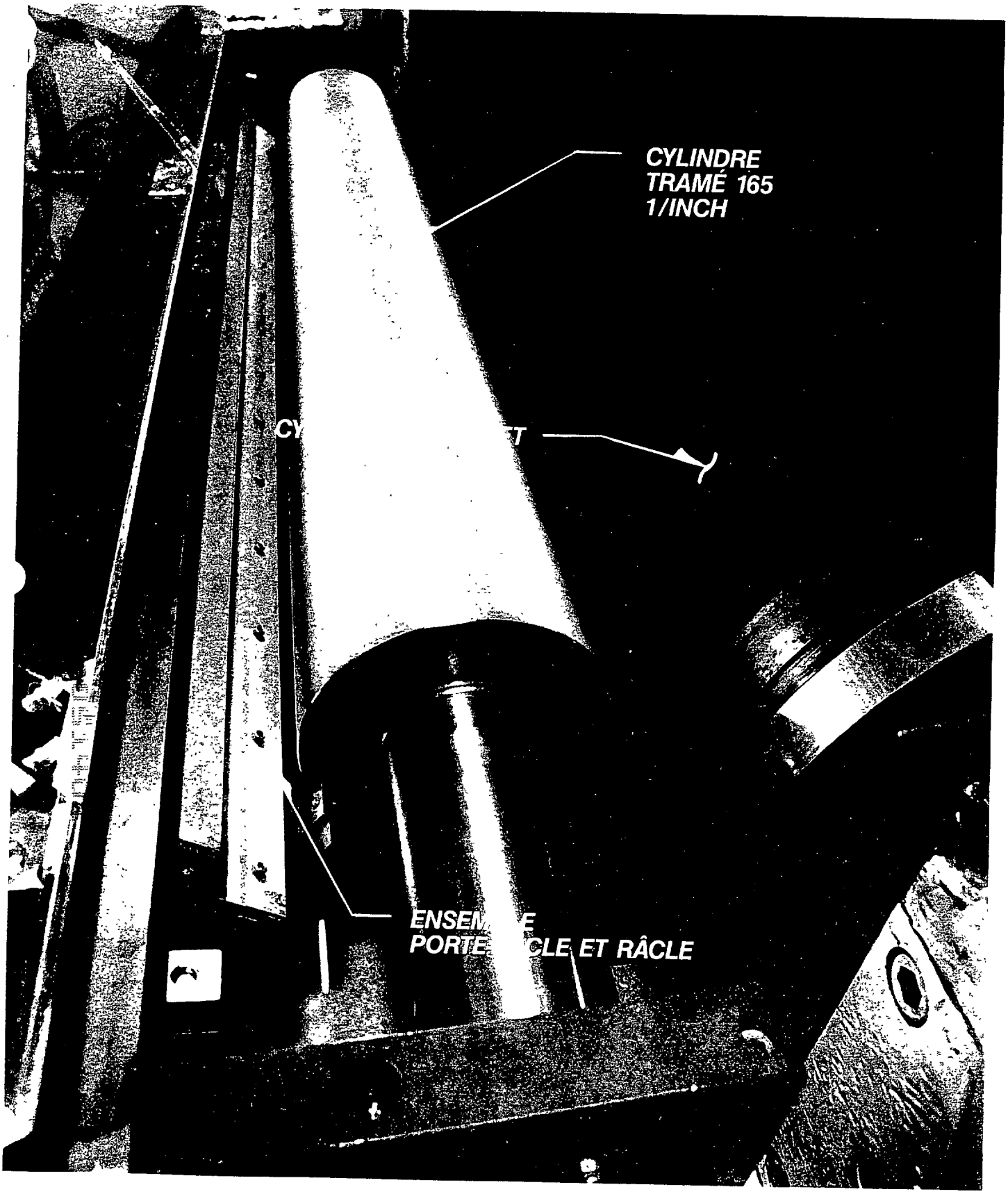
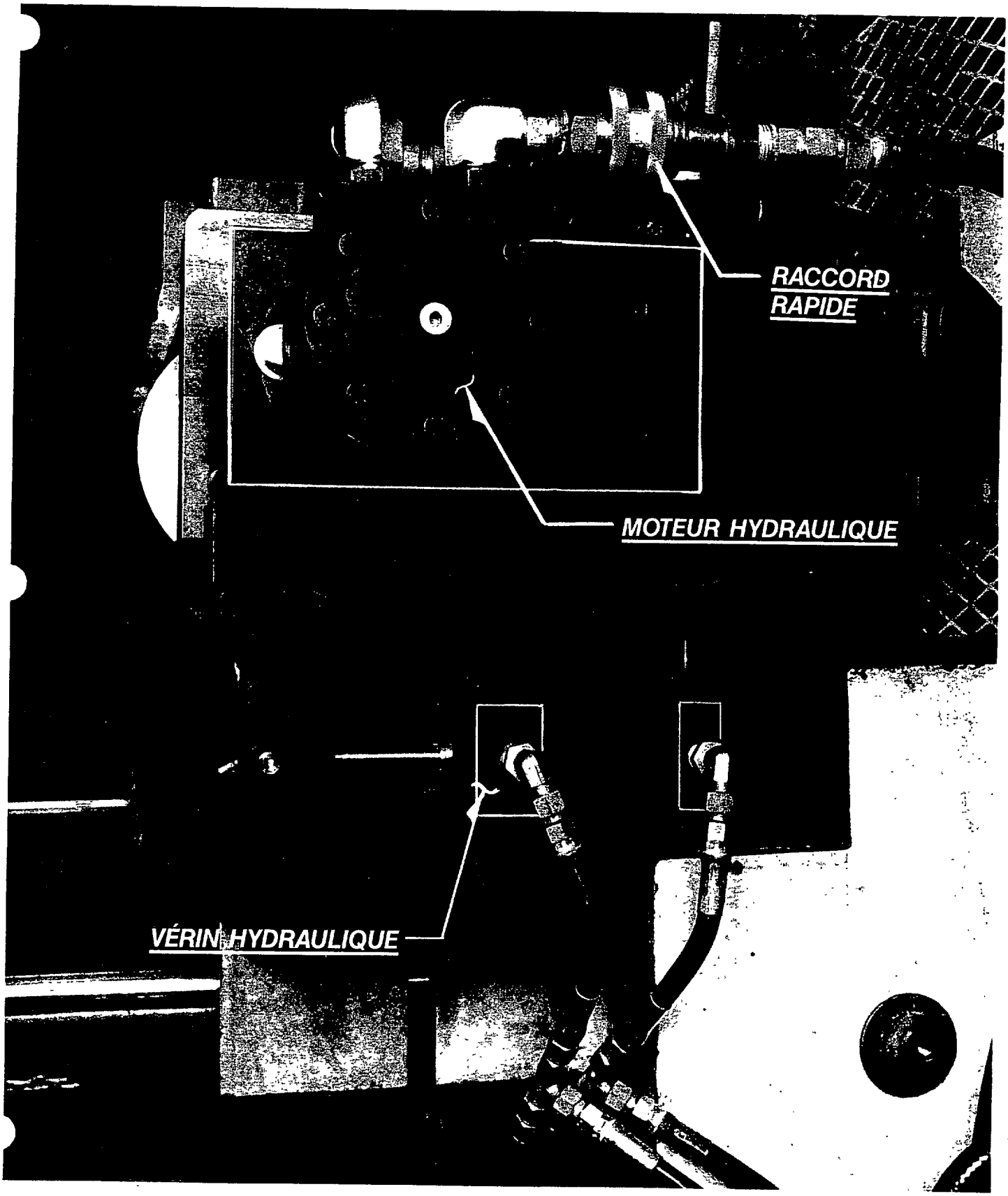
DAHLGREN®

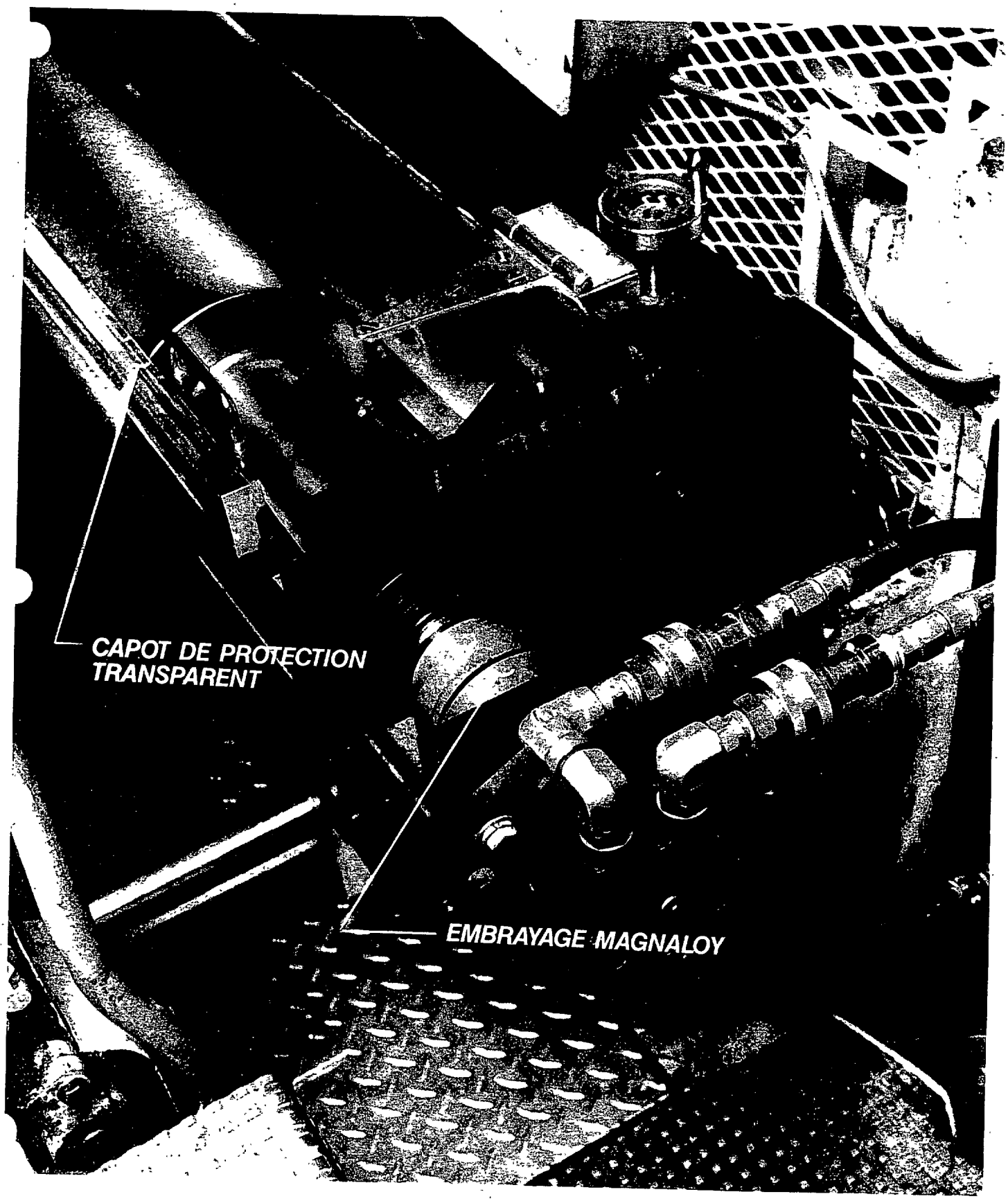
GROUPE DE VERNISSAGE BLANCHET

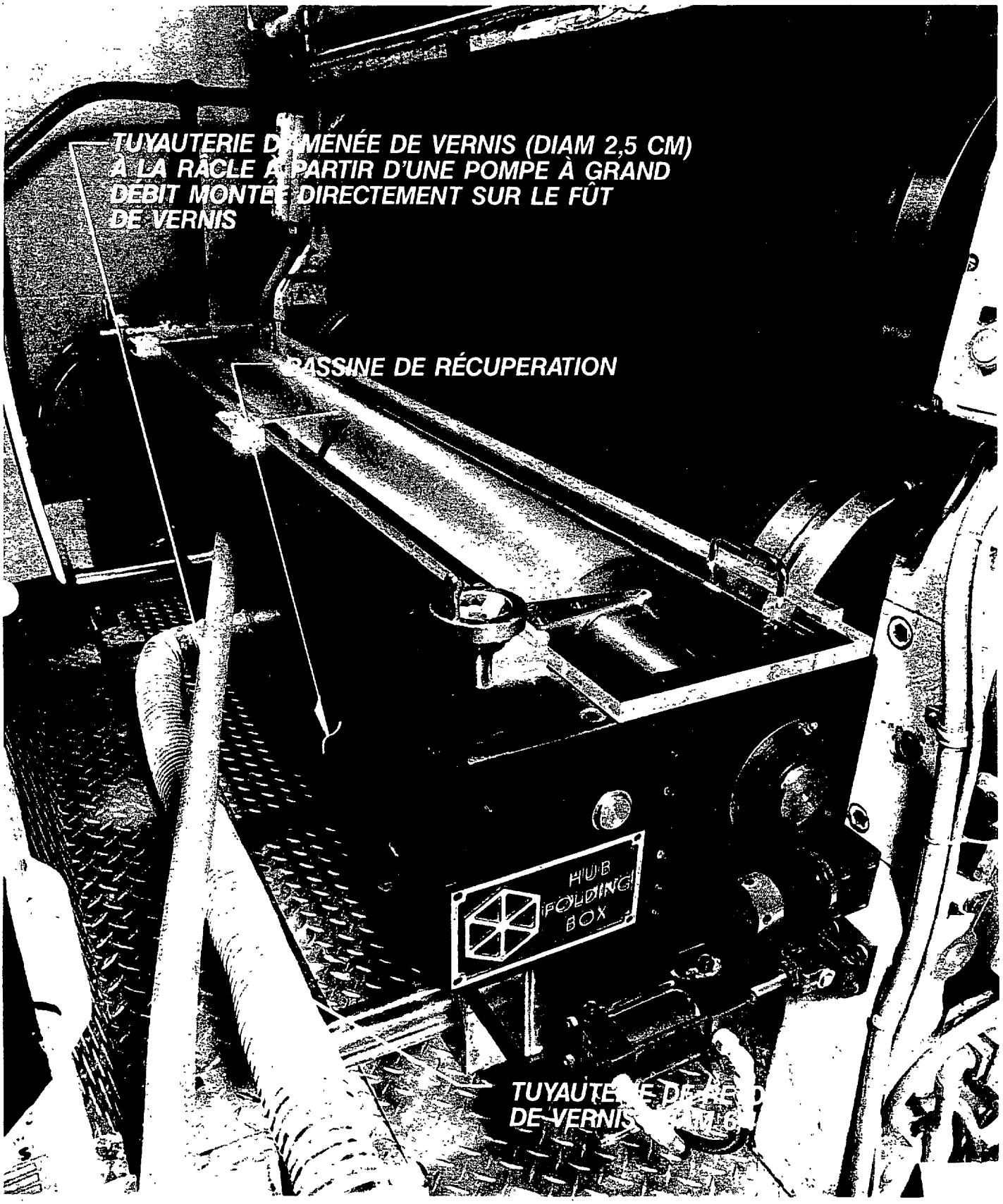
Presentation visuelle

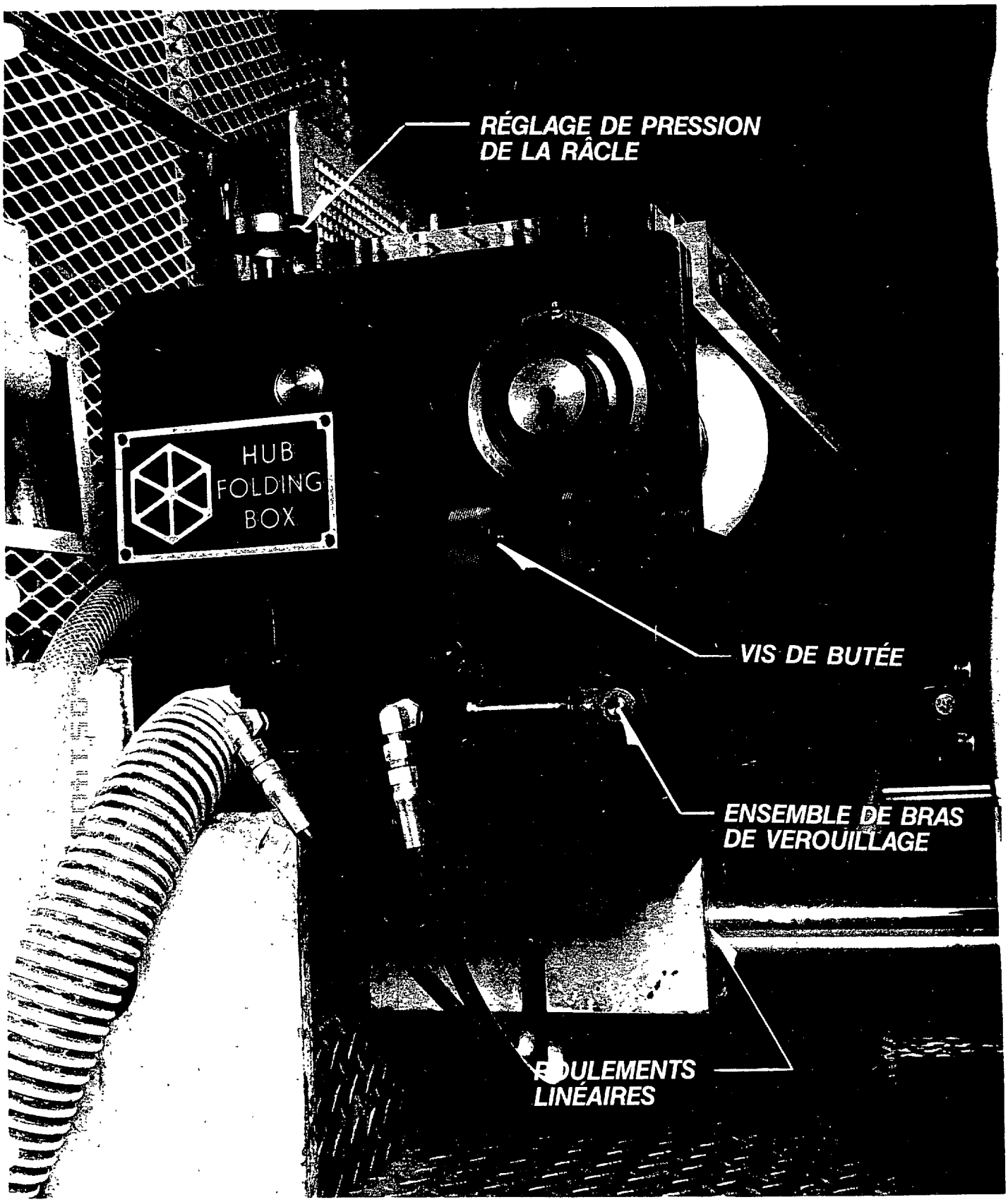

CYLINDRE
TRAMÉ 165
1/INCH
CY T
ENSEM E
PORTE CLE ET RÂCLE

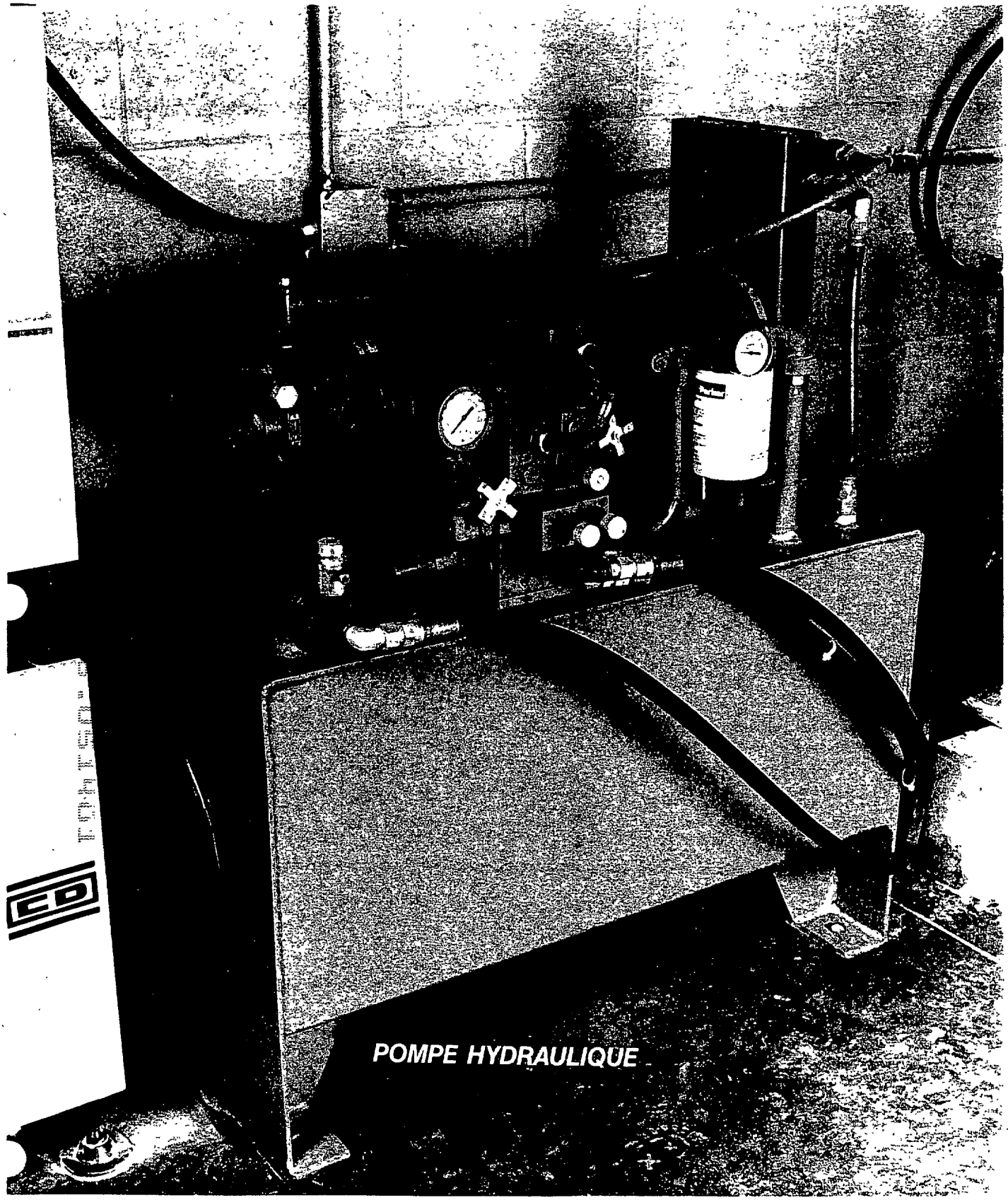

RACCORD
RAPIDE
MOTEUR HYDRAULIQUE
VÉRIN HYDRAULIQUE


TO RAISE
TO LOWER
EN 3 PARTIES


CAPOT DE PROTECTION
TRANSPARENT
EMBRAYAGE MAGNALOY

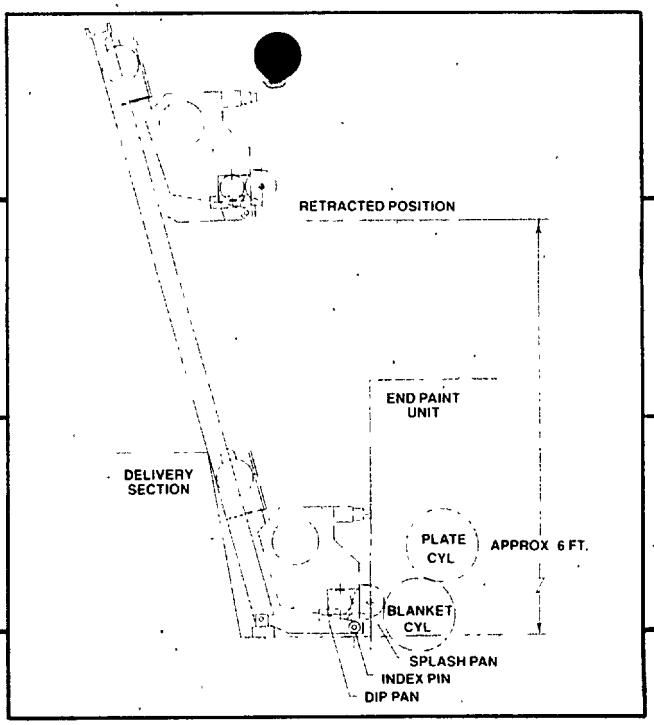

TUYAUTERIE D[illegible]MÉNÉE DE VERNIS (DIAM 2,5 CM)
À LA RACLE À PARTIR D'UNE POMPE À GRAND
DÉBIT MONTÉE DIRECTEMENT SUR LE FÛT
DE VERNIS
[illegible]ASSINE DE RÉCUPERATION
HUB
FOLDING
BOX
TUYAUTE[illegible]
DE VERNIS


RÉGLAGE DE PRESSION
DE LA RÂCLE
HUB
FOLDING
BOX
VIS DE BUTÉE
ENSEMBLE DE BRAS
DE VEROUILLAGE
ROULEMENTS
LINÉAIRES


POMPE HYDRAULIQUE

OXY-DRY

Blanket Coater



Applications

This unit is capable of producing high quality results with a wide variety of coating materials including aqueous, U.V., etc.

These coatings provide a wide variety of benefits to your product. For example, high gloss, grease and water resistance, improved rub characteristics. Typically coated products are covers, brochures, packaging, labels and bags.

Operation

The coating unit is positively positioned by interlocking/ alignment pins assuring the proper relationship between the press blanket cylinder and the coating unit. The design of this coater provides a quick release mechanism between the rubber & ceramic rolls. This mechanism utilizes positive stops to allow disengagement without the necessity of readjustment when put back in operation. Disengagement is necessary to prevent "flat spots" on the rubber roll when the coater and/or press are shut down.

The ceramic and rubber rolls on the Oxy-Dry Coater are independently driven by controled torque D.C. motors. This drive system provides inherent overload protection to prevent damage to the rolls along with convenient speed control (coating weight control). Once the coater to blanket speed relationship is selected, that ratio remains constent as press speed is changed providing consistent coating throughout the presses speed range.

The coater retraction mechanism is actuated by a heavy duty self locking acme screw which eliminates the need for a locking device which would be necessary for ball screw device. This feature provides the greatest degree of safety and reliability.

The coating handling system offers several unique features to enhance the convenience of operation of this unit. Some of them are as follows.

A The coater uses a "two pan" arrangement. This consists of a dip pan where circulated coating is delivered to the rubber roll. There is a second "dryer" splash pan positioned to catch spray and any foreign matter which could contaminate the coating solution. Both of these pans are removable by hand without the use of tools for clean up purposes.

B The coating material handling system consists of two pumps. The first is utilized to recirculate the coating solution and the second is a drain pump to ensure overflow free circulation. The drain pump can be operated independently to assist in clean-up operations.

C Construction, the design of this unit is consistent with Oxy-Dry's long service life philosophy. Construction is heavy duty with ease of serviceability.

The ceramic coating roll is "pillow block" mounted and the rubber transfer roll is mounted in a slide mechanism. Change over can be accomplished on the press without disassembly of the coater frame and drive mechanism.

Controls

The Oxy-Dry Blanket Coater is interfaced into the press via a programmable controller. This allows adaptability to many different press control systems and ease of changing coater operating sequences.

All electrical components are commercially available high quality items. This provides maximum dependability and economical servicing.

OXY DRY ®

OXY-DRY CORPORATION

2011 Landmeier Road
Elk Grove Village, IL 60007
(312) 593-2030
TWX 910-222-3458
FAX 312- 593-0172

217 Highland Parkway
Roselle, NJ 07203
(201) 241-5440 (212) 732-2958
TWX 710-996-5979
FAX 201 241-0280

17972 Sky Park Circle
Suite H
Irvine, CA 92714
(714) 261-1441

Oxy-Dry (UK) Limited
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Pin Green, Stevenage
Herts SG1 4QS, England
Stevenage (0483) 728881
Telex: 826939

Oxy-Dry Maschinen G.M.B.H.
Bosch-Ring 19
D-6073 Egelsbach
West Germany
(06) 103 4166
Telex: 417920

OXY-DRY CORPORATION
2011 Landmeier Road Elk Grove Village, Illinois 60007

312/593-2030
312/282-8000

Telex 910-222-3458

T. Bill Davis

November 20, 1987

Williamson Printing Co.
6700 Denton Drive
Dallas TX 75235

ATTENTION: PRESIDENT

Dear Sir:

Having recently been elected to the Presidency of Oxy-Dry Corporation, succeeding our retiring former President, Jack Pettersen, I've decided to contact a number of our current customers with a special program as a get acquainted offer. Details are given below:

In addition to the attached special offers, I have enclosed a brochure introducing a new product that Oxy-Dry Corporation has been developing for some time now. In our opinion, this is not only extremely well engineered and ruggedly built, but it's a product that eventually every printer must have. It offers speed consistency and efficiency. It's the new Oxy-Dry High Speed Blanket Coater.

I would like to encourage you to read the attached brochure and specifications. I believe it tells the story of WHY. As a matter of fact, if you have any thoughts on this or any of our other fine products, I would appreciate hearing from you. Oxy-Dry has been in business for over 45 years and specifically two words that uniquely describe our internal dedication are: Quality and Integrity.

SPECIAL OFFER: Our Sales Department generated the attached green sheets concept as a thank you gesture for the many years of your support and business. As mentioned above, we'd all very much appreciate your feedback on not only the attached supply items but on any item of related interest.

Thank you again for your continued support over the years.

Sincerely,

OXY-DRY CORPORATION

E. T. McLoughlin

Edward T. McLoughlin
President

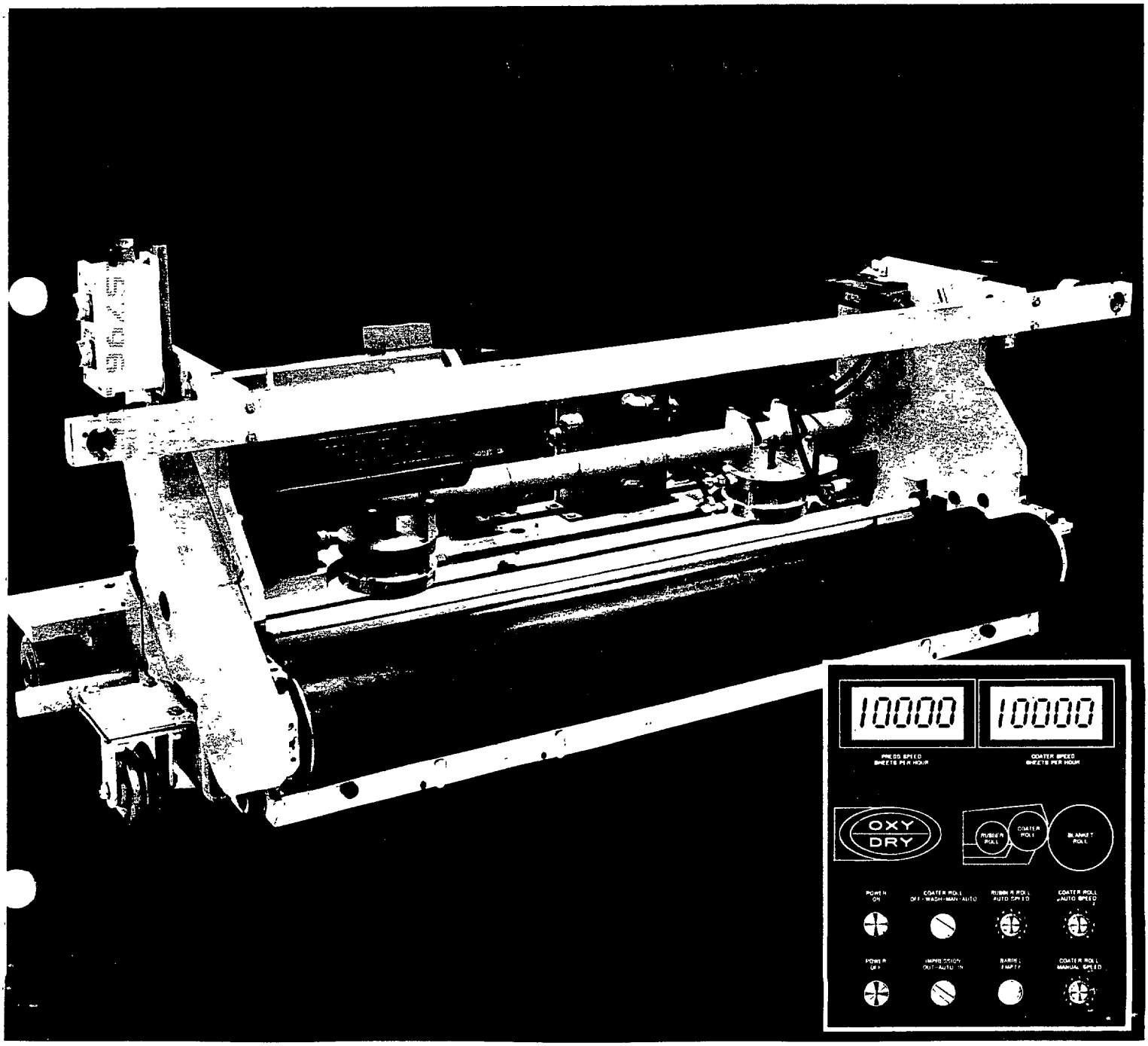
ETM/rmo

Enclosures

The very best way to apply coating is with an

OXY-DRY COATER

Now your printing can be worth more, much more



Coating makes a big difference

and here's why:

This Oxy-Dry Coater specification sheet has been printed with coating. Feel it and then objectively contemplate the comparisons . . it gives an everlasting focus of quality to the printed piece. It makes your printing worth more . . much more, because it's magnificently different and will give you a leg up on the competition. The new Oxy-Dry Coater has been engineered to readily fit most presses. It is ruggedly constructed and simple to install and operate. The Oxy-Dry Coater saves time and assures a smooth uniform application of aqueous coating. In addition, it reduces the use of offset powders. Quality coating generates high gloss, improved rub resistance, regulated surface slip and controlled variations in luster.

Oxy-Dry invented and pioneered the Electrostatic Sprayer to prevent offset and developed the powder formulas to go along with the electrostatic sprayers as well. Oxy-Dry in almost 50 years of serving the printing industry with revolutionary new products such as the Blanket Washers, Ink Agitators, Ink Levelers, Sheeters, Stackers, Color-to-Color Systems, Cut-off Controls, Web Breaks and Web Guides, has also brought to market a Dryer that provides the right drying acceleration. Oxy-Dry is proud to engineer another much needed and valued accessory to the printing press. The Oxy-Dry Coater now adds a truly new dimension to printing.

COMPARISON OF COATINGS

COATING	AQUEOUS	U.V.	PRESS VARNISH
Gloss	Good/Excellent	Excellent	Fair
Rub	Good/Excellent	Excellent	Fair
Glue Applications	Excellent	Fair	Poor
Thickness Control	Excellent	Good	Fair
Finger Prints	Excellent	Poor	Fair
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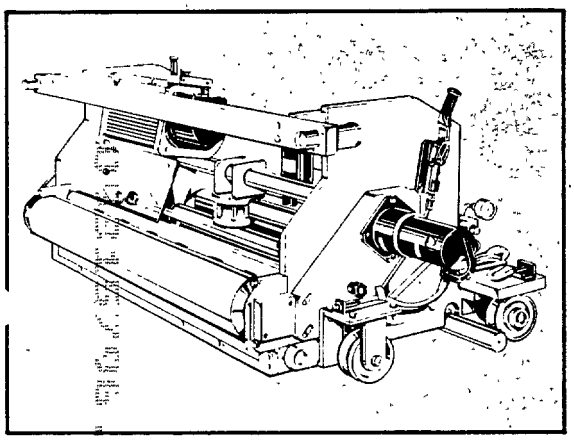
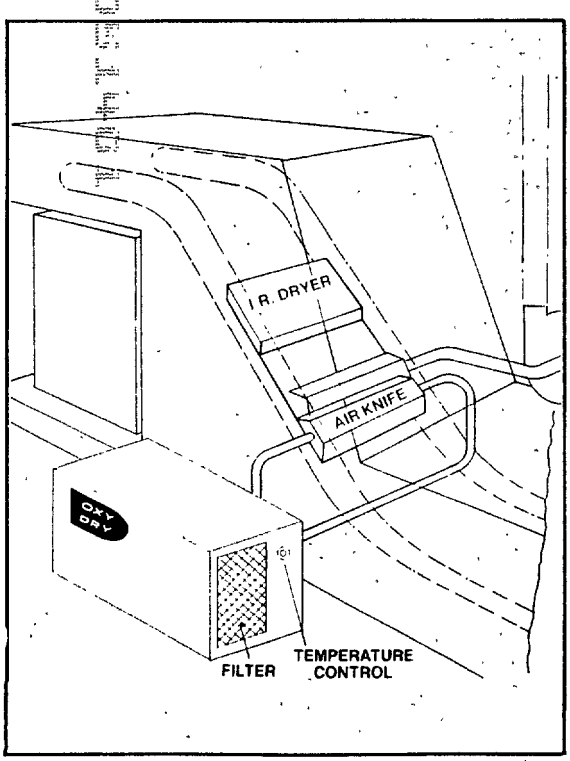
Coating Costs	Economical	Expensive	Economical

The Oxy-Dry System





Oxy-Dry Coater Facts

1 **Control of Coating:** The Oxy-Dry Coater allows a wide range of coating thickness and infinite control with just a turn of a dial on the control panel.

2 **Simplicity of Operation:** The Oxy-Dry Coater is designed to return to a pre-set position each time the coater is used, no costly makeready adjustment

3 **Ease of Maintenance:** The Oxy-Dry Coating System provides easy access to rollers and recirculating system. Makeready and Washup will take approximately 15 minutes.

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Oxy-Dry Medium Wave Infrared Dryer

The main advantages of the Oxy-Dry Infrared Dryer are.

- Variable/Medium wave length radiation with high intensity output
- Quick response
- Significant energy savings
- Simplicity of operation

To achieve an optimum of infrared radiation high intensity output it is necessary to heat the substrate within the minimum distance of sheet travel. A quick response is also essential—in that an instantaneous heat up and cool down is required when the press comes on or off impression The Oxy-Dry "tubeless" dryer is most unique in these two features—high intensity output coupled with quick response.

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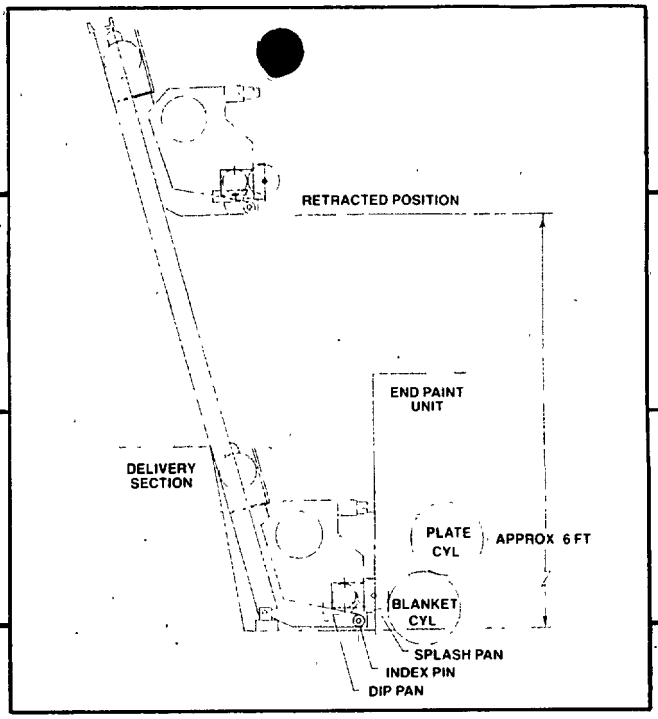
OXY-DRY

Blanket Coater



Applications

This unit is capable of producing high quality results with a wide variety of coating materials including aqueous, U.V., etc.

These coatings provide a wide variety of benefits to your product. For example, high gloss, grease and water resistance, improved rub characteristics. Typically coated products are covers, brochures, packaging, labels and bags.

Operation

The coating unit is positively positioned by interlocking/ alignment pins assuring the proper relationship between the press blanket cylinder and the coating unit. The design of this coater provides a quick release mechanism between the rubber & ceramic rolls. This mechanism utilizes positive stops to allow disengagement without the necessity of readjustment when put back in operation. Disengagement is necessary to prevent "flat spots" on the rubber roll when the coater and/or press are shut down.

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Stevenage (0483) 728881
Telex: 826939

Oxy-Dry Maschinen G.M.B.H
Bosch-Ring 19
D-6073 Egelsbach
West Germany
(06) 103 4166
Telex: 417920

Best Buy Ever!

OXY DRY®

BUY 3 NOW
GET THE 4TH FREE!

Electrostatic Tubes For OXY-DRY Sprayers

Fits most other electrostatic sprayers

SAVE $35-$40 OR MORE depending on size

A very special offer for a limited time on craftsman built electrostatic tubes.

Offer expires Dec. 15, 1987

Take advantage of this special offer by returning this coupon today.

We've never made an offer like this before. It is an unusual offer that saves you more . . much more.

Your order No. _____

Make of press _____

Tube size—length _____

(Please print)

Ship To: _____

Company Name _____

Address _____

City _____ State _____ Zip _____

_____ _____

Authorized Signature Date

Send coupon to OXY-DRY Corporation, 2011 Landmeier Road, Elk Grove Village, IL 60007

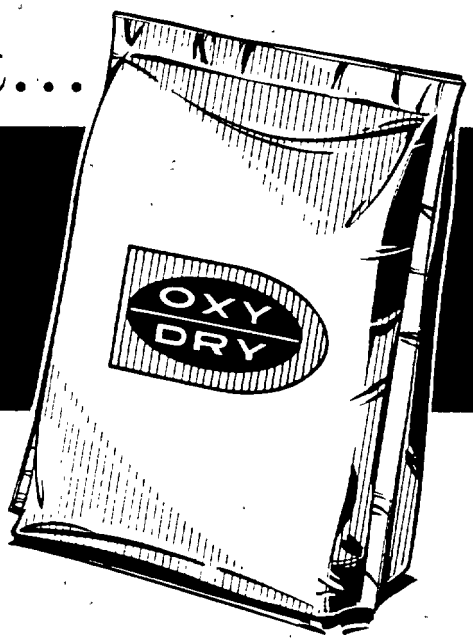
Brand New from OXY DRY®

The very best way to prevent offset is with OXY-DRY Powders

OXY-DRY POWDERS IN A NEW 2-LB. SINGLE SERVING POUCH

Test it–you'll like it...

FREE SAMPLE POUCH



IDEAL SIZE FOR EASY HANDLING

We'll send you your 2-lb. pouch just for answering these few questions.

Our pouch approach is brand new. We believe it will make loading a sprayer neater, easier and cleaner. The new OXY-DRY Pouch can be purchased with 5 to a carton.

The Pouch Powder is OXY-DRY Powder 744, micron size 27.

For other OXY-DRY powders refer to the OXY-DRY Powders specification sheet

Offer expires Dec. 15, 1987

---

① What powders are you presently using?

_____

_____

② What micron size powder do you use?

_____

③ Press(es) you presently use?

_____

_____

④ Type of printing you perform?

_____

_____

⑤ *Do you use an OXY-DRY Sprayer or other brand?*

Please specify _____

_____

(Please print)

Ship To. _____

Company Name _____

Address _____

City _____ State _____ Zip _____

_____ _____

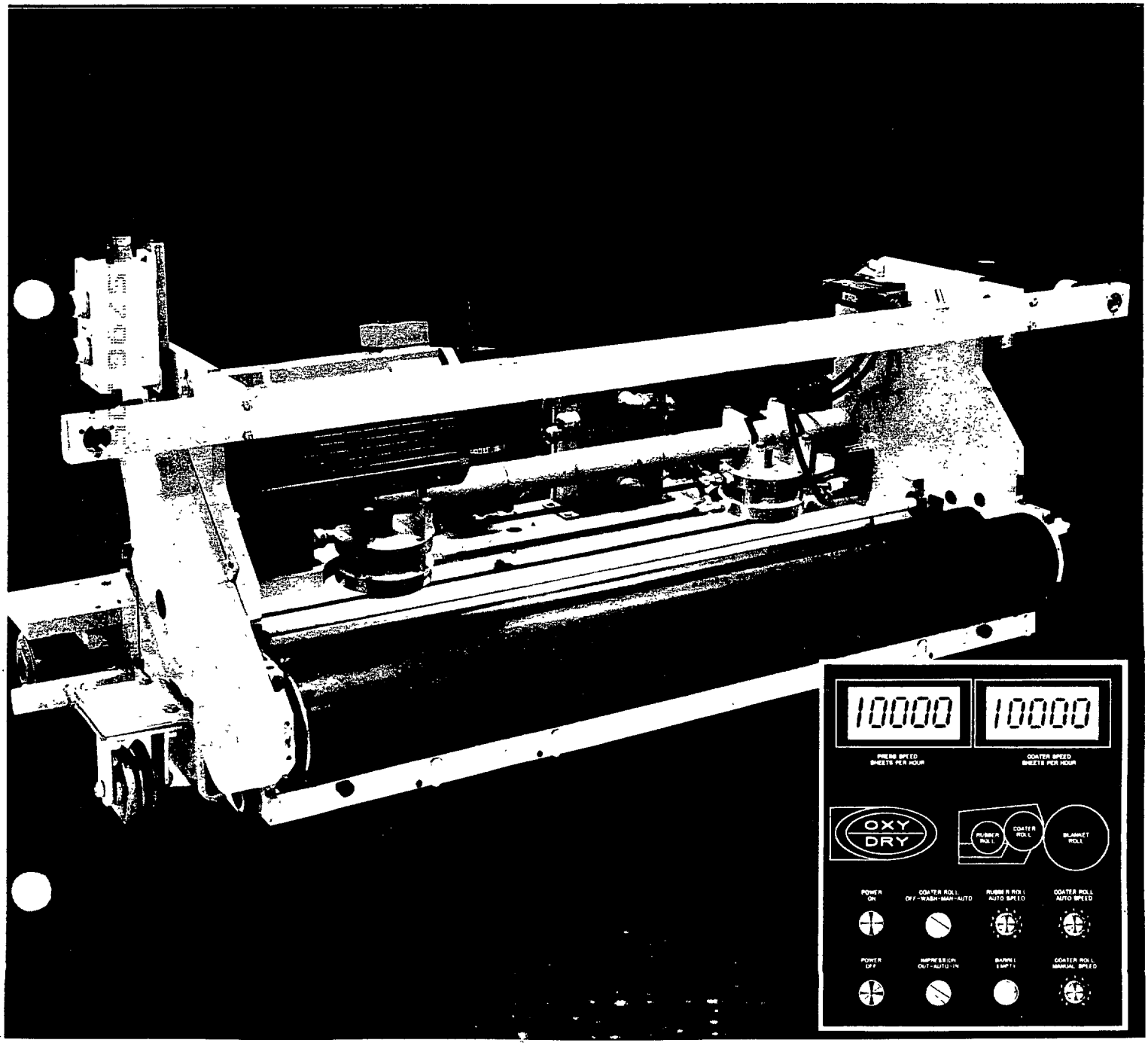
Authorized Signature Date

Send to: **OXY-DRY CORPORATION**
2011 Landmeier Road
Elk Grove Village, IL 60007

The very best way to apply coating is with an

OXY-DRY COATER

Now your printing can be worth more, much more



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OXY-DRY CORPORATION
2011 Landmeier Road, Elk Grove Village Illinois 60007
Area Code 312 593-2030
312/282-8000
Telex 910-222-3458

OXY-DRY HIGH SPEED BLANKET COATER

APPLICATIONS

This unit is capable of producing a high quality product with a durable finish while utilizing a wide variety of coating materials to include the aqueous, U.V., or related coating materials.

These coatings can provide a variety of benefits to your printed products. For example: high gloss, increased grease and water resistance and improved rub characteristics. Typically coated products are covers, brochures, packaging labels and bags.

OPERATION

The coating unit is positively positioned by interlocking/alignment pins assuring the proper relationship between the press blanket cylinder and the coating unit. The design of this coater provides a quick release mechanism between the rubber and ceramic rolls. This mechanism utilizes positive stops to allow disengagement without the necessity for readjustment when put back in operation. Disengagement is necessary to prevent "flat spots" on the rubber roll when the coater and/or press are shut down.

Touque controlled rolls on the Oxy-Dry Coater are independently driven by controller torque D.C. motors. This drive system provide inherent overload protection to prevent damage to the rolls along with convenient speed control. Once the coater to blanket speed relationship is selected, that ratio remains constant as press speed changes. This provides consistent coating throughout the press speed range.

As the coater retraction mechanism is actuated, heavy duty self-locking acme screws eliminate the need for a locking device which would normally be used in ball screw mechanisms. This feature provides the greatest degree of safety and reliability for the end user.

1. The coater uses a "two pan" arrangement. This consists of a dip pan where circulated coating is delivered to the rubber roll. There is a second "dry" drip pan position to catch spray and any foreign matter which could contaminate the coating solution. Both of these pans are removable by hand without the use of tools for clean-up purposes.

OXY-DRY HIGH SPEED BLANKET COATER

OPERATION (continued)

2. The coating material handling system consists of two pumps. The first is utilized to recirculate the coating solution and the second is a drain pump to ensure overflow free circulation. The drain pump can be operated independently to assist in clean-up operations.

3. Construction - The design of this unit is consistent with Oxy-Dry's long service life philosopy. Construction is heavy duty with ease of serviceability.

CONTROLS

The Oxy-Dry Blanket Coater is interfaced into the press with a programmable controller. This allows adaptability to many different press control systems and ease of changing coater operating sequences.

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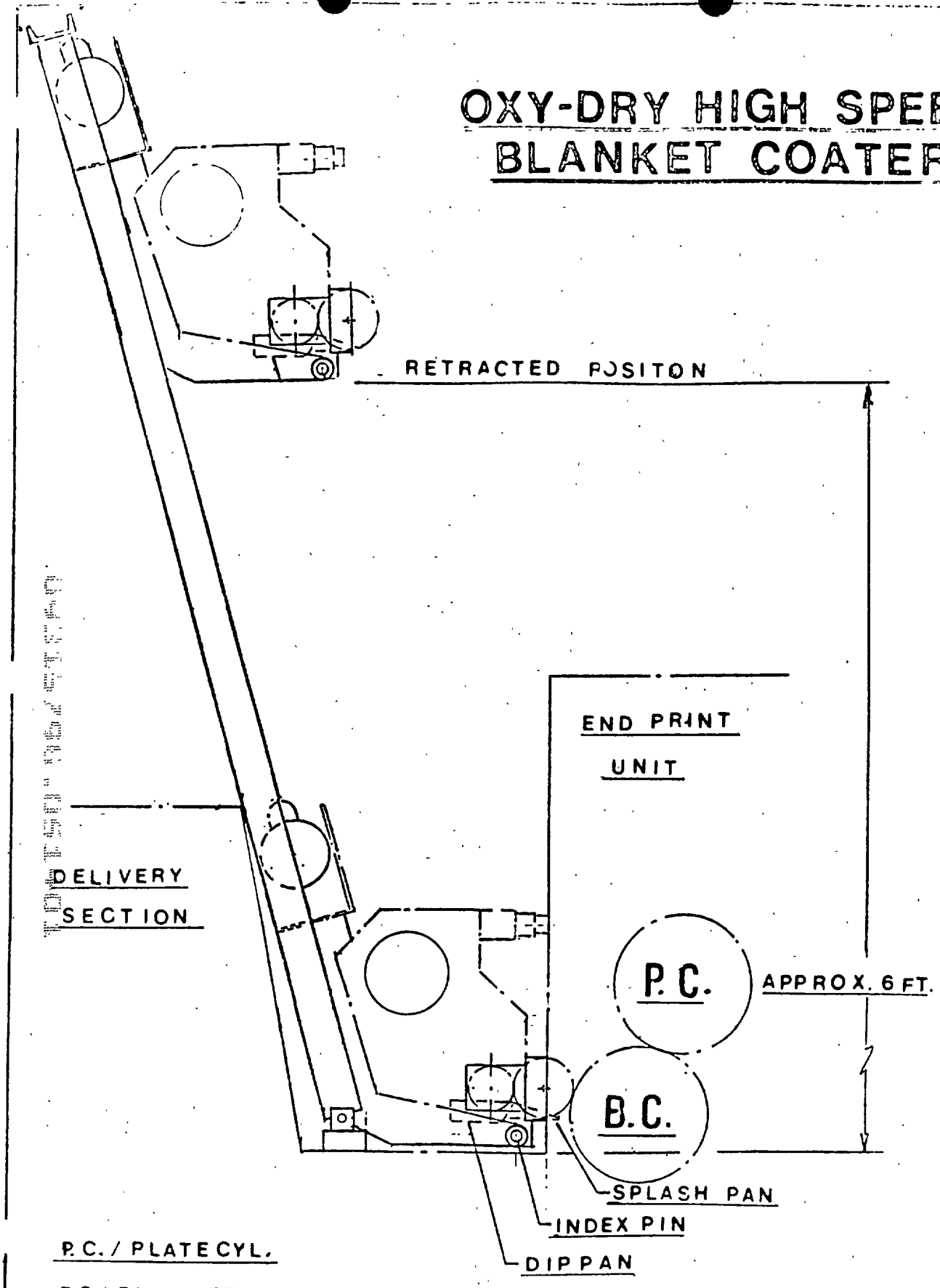
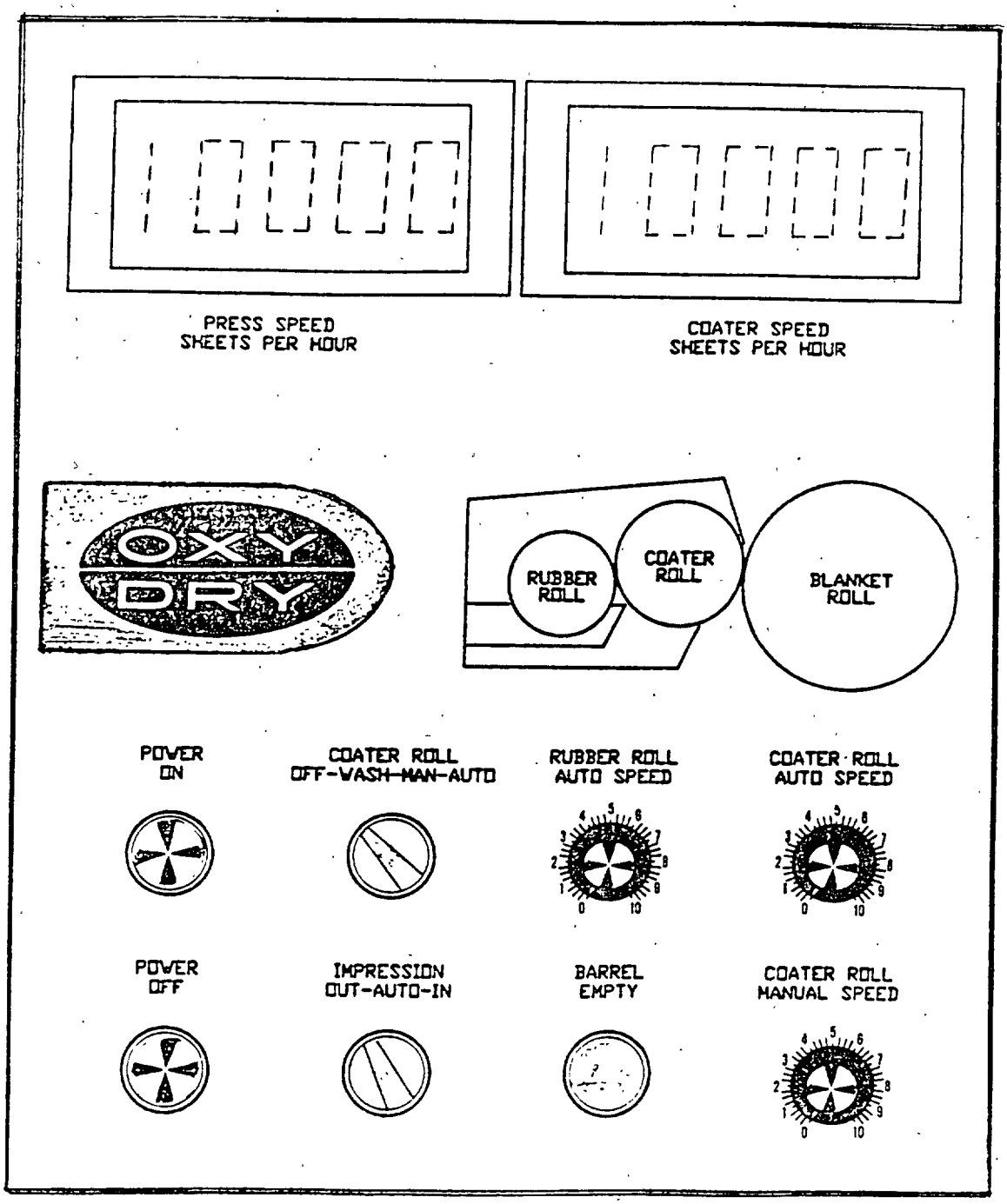
OXY-DRY HIGH SPEED BLANKET COATER



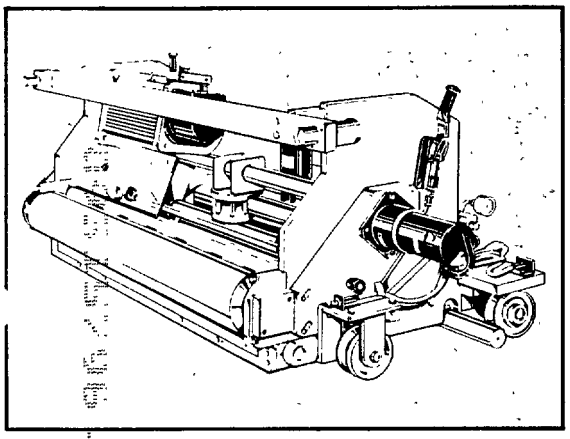
P.C. / PLATE CYL.

B.C. / BLANKET CYL.



OXY-DRY HIGH SPEED BLANKET COATER

The Oxy-Dry System



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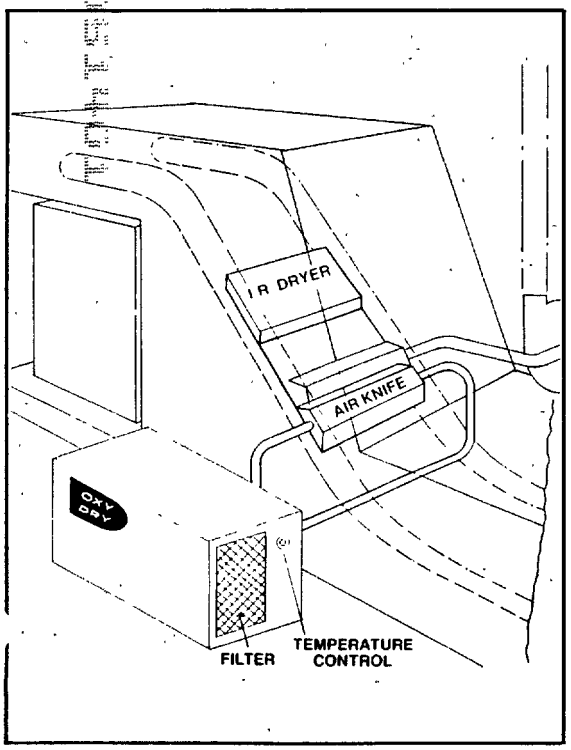

Oxy-Dry Medium Wave Infrared Dryer

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- Variable/Medium wave length radiation with high intensity output
- Quick response
- Significant energy savings
- Simplicity of operation

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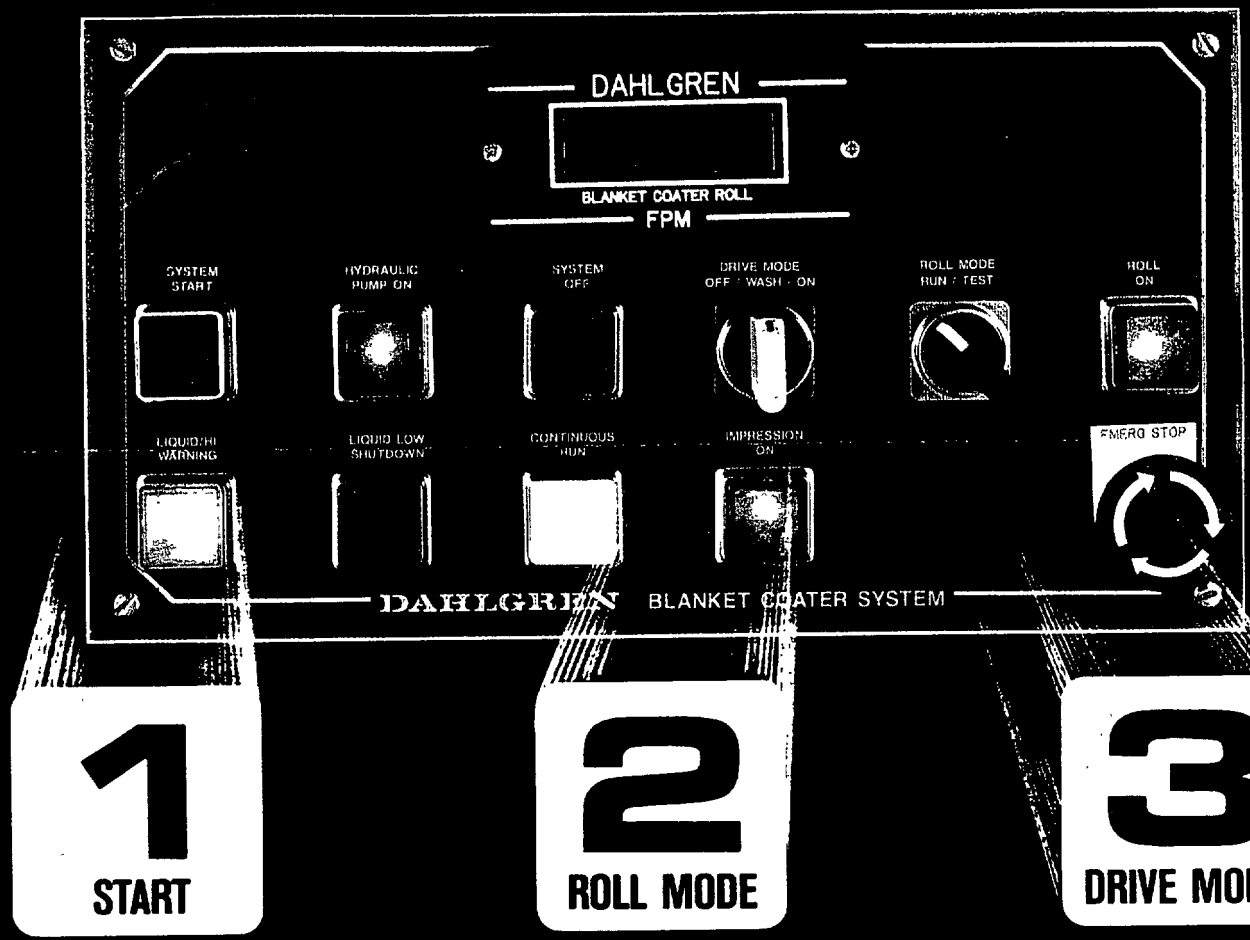
50

The best Coater on the market is also the easiest to operate — as simple as...



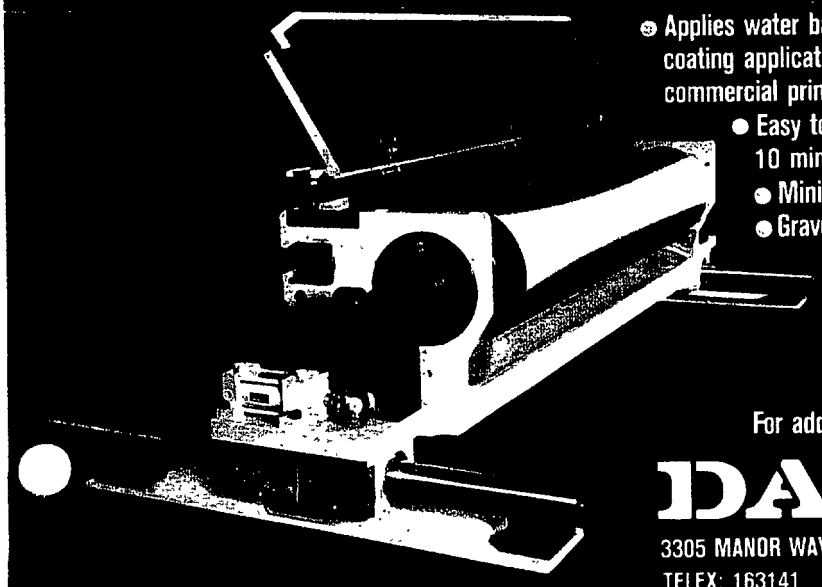
1 START

2 ROLL MODE

3 DRIVE MODE

As is always the case — the best solution to a problem is the simplest. Dahlgren's 20 years of experience in building Coaters has resulted in the most popular Coater on the market.

The reasons are simple...Dahlgren's single roll Coater:



- Applies water base. U.V. and heat seal coatings for a broad range of coating applications — including blister packaging, labels, cartons and commercial printing.
- Applies overall or exact pattern coatings.
- Easy to operate — 5 minutes maximum makeready; 10 minutes cleanup.
- Strong durable construction.
- Minimum maintenance due to fewer parts.
- Gravure roll hydraulically locks to blanket — eliminates chattering and slinging.
- Available for all popular sheet fed presses.
- The most competitively priced on the market.

For additional information contact:

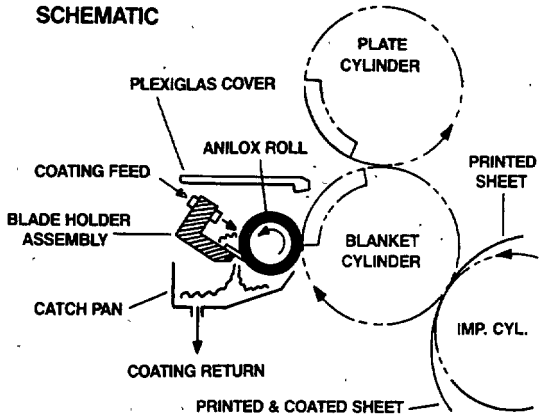
DAHLGREN

3305 MANOR WAY DALLAS, TEXAS 75235 214/357-4621 1-800/527-5301

TELEX: 163141

Product Data DAHLGREN BLANKET COATER

SCHEMATIC



SCHEMATIC DESCRIPTION:

Coating is accomplished with a single gravure roll in pressure contact with an offset press blanket. Coating on the blanket is then applied to the previously wet (or dry) printed sheet. Enroute to the delivery, the sheet is dried with Dahlgren heating lamps and forced air.

A uniform quantity of coating is continuously offered to the press. While the blade removes excess coating from the surface of the roll, engraved cells (voids) on the surface, carry a pre-selected precise volume of coating to the blanket. Coating removed from the cells by the blanket is replenished upon rotation to a flooded-nip at the blade/roll interface. (Coating not removed by the blanket is re-wetted at this nip.) Accumulation, starvation, roll run-out, streaks, etc., are non-existent. The roll is positively driven in both "On" and "Off" positions. Fresh coating is continuously circulated through the coater.

STANDARD FEATURES:

- Rugged, unitized construction for bolt-on adaptation to press frames.
- Horizontal actuation and quick-release retraction from press blanket to remote area of last press unit.

APPLICATOR ROLL ASSEMBLY:

- Heavy wall steel tubing.
- Precision engraved surface (copper, nickel and chrome plated).
- Statically and dynamically balanced.
- Pre-selected volume carrying capacity meeting specific customer coat weight requirements.
- Hydraulically driven at press speed.
- Mounted in heavy-duty, oversized, anti-friction bearings
- Accurately positioned and hydraulically locked against press mounted "ON" stops.

OTHER FEATURES:

- Rugged blade holder.
- Adjustable pressure capability of blade to coater roll with "Max" pressure limiting stops.
- Flexible, replaceable, "blue-steel", hardened and tempered doctor blade.
- Fixed-angle "wiping" design for doctor blade.
- Coating catch pan under blade holder and coating roll.
- Hinged, clear plexiglas cover over blade holder assembly and coating roll. Serves as bench when cleaning or changing blanket.
- Hydraulic power unit, pre-plumbed and tested with 20 gallon reservoir and 5 H.P. TEFC motor and fixed displacement pump. Flow-control valves for hydraulic motor and actuation cylinders.
- Electrical probes sensing coating flow and level (at coater inlet and in catch pan).
- Operator control station with enclosure and operator devices, with digital "FPM" readout.
- "NEMA 12" power control cabinet with control circuit isolation transformer.

CIRCULATION SYSTEM:

- Feed and return, constant displacement pump.
- Variable speed air-motor drive to pump.
- Positive drain and return of coating to drum.
- Quick-disconnects at coater head, catch pan and supply drum
- Quick-disconnects for customer furnished wash-up lines
- 3/4" I.D. flexible, vinyl tubing.

OPTIONAL EQUIPMENT:

- Custom designed coater retraction systems.
- Custom designed coating circulation systems.

ELECTRICAL/PNEUMATIC INPUT REQUIREMENTS:

Standard: 230 VAC ± 10%, 3-phase, 60 Hz, 25 Amps (10 KVA) Load

Optional: 460 VAC ± 5%, 3-phase, 60 Hz, 15 Amps (12 KVA) Load
380 VAC ± 5%, 3-phase, 50 Hz, 15 Amps, (10 KVA) Load

SHEET-FED PRESSES DESIGNED FOR:

AURELIA	HARRIS	MARINONI	O.M.C.S.A.
BOBST	HEIDELBERG	MIEHLE	PLANETA (ROYAL ZENITH)
COLOR METAL	KOMORI	MILLER	SOLNA
CRABTREE	M.A.N.	MITSUBISHI	OTHERS
HALM	MANN	NEBIOLO	

WARRANTY SERVICE:

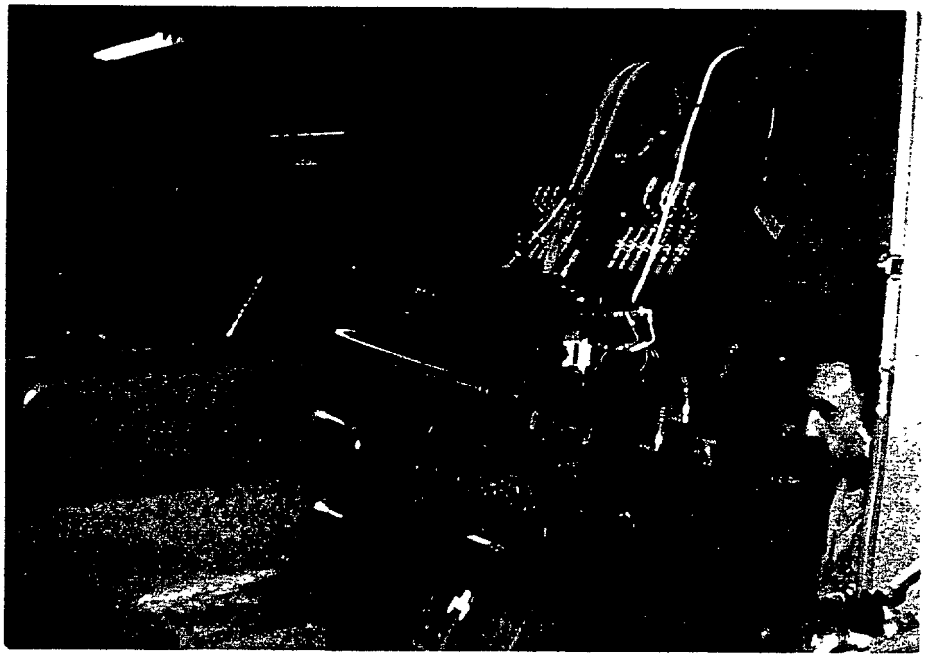
- Installation and start-up supervision
- 6 months gravure roll warranty
- 90 day service warranty
- 12 months — other parts warranty

PATENTS PENDING

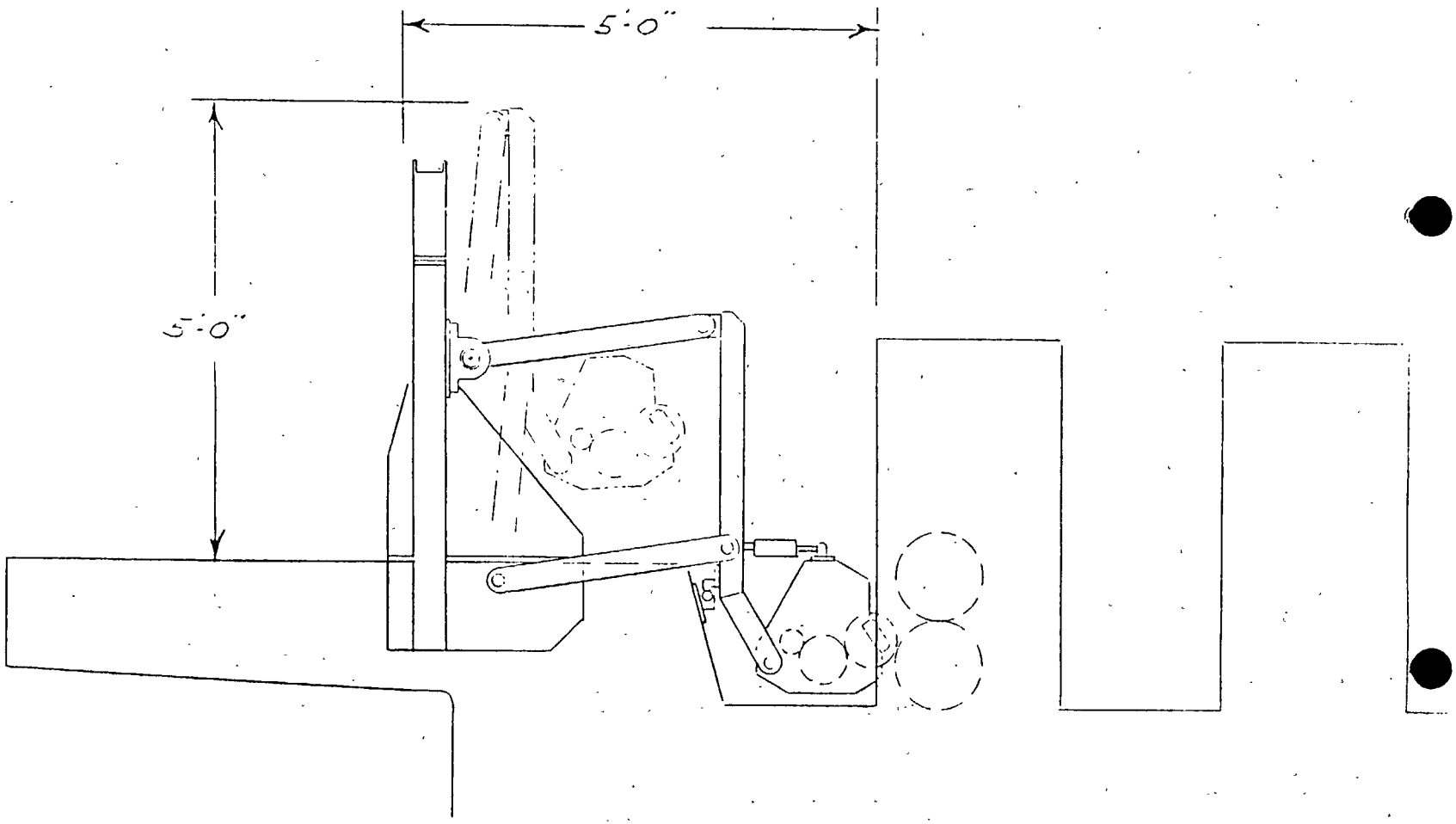
DAHLGREN

DAHLGREN U.S.A., P.O. BOX 36305, DALLAS, TEXAS 75235
TEL: (214) 630-3234, WATS: 800-527-5301, TLX: 163141

51



PRESS	REMOVAL SYSTEM	RAPIDAC BLANKET COATER MODEL NO.	SPARE ROLLS PART NOS. APPLICATOR	PICKUP	METERING
Miller 41"	Yes	A-2002	D-2000-1-1	D-2000-2-1	D-2000-3-1
Heidelberg 40"	Yes	A-2003	D-2000-1-2	D-2000-2-2	D-2000-3-2
Komori 40"	Yes	A-2006	D-2000-1-2	D-2000-2-2	D-2000-3-2
Planeta 40"	Yes	A-2009	D-2000-1-2	D-2000-2-2	D-2000-3-2
[illegible] 50"	Yes	A-2012	D-2022-1-4	D-2022-2-4	D-2022-3-4
Planeta 55"	Yes	A-2015	D-2022-1-3	D-2022-2-3	D-2022-3-3
Planeta 64"	Yes	A-2018	D-2022-1-2	D-2022-2-2	D-2022-3-2
Miehle 60"	Yes	A-2021	D-2022-1-1	D-2022-2-1	D-2022-3-1
Harris 60"	Yes	A-2024	D-2022-1-1	D-2022-2-1	D-2022-3-1
Harris 60"	Yes	A-2028	D-2022-1-1	D-2022-2-1	D-2022-3-1
Harris 60"	Yes	A-2029	D-2022-1-1	D-2022-2-1	D-2022-3-1
Planeta 50"	No	A-2031	D-2032-1-1	D-2032-2-1	D-2032-3-1
Planeta 55"	No	A-2033	D-2032-1-2	D-2032-2-2	D-2032-3-2
Planeta 64"	No	A-2035	D-2032-1-3	D-2032-2-3	D-2032-3-3
Harris 60"	No	A-2037	D-2032-1-4	D-2032-2-4	D-2032-3-4
Crabtree 50.5"	No	A-2039	D-2040-1-1	D-2040-2-1	D-2040-3-1

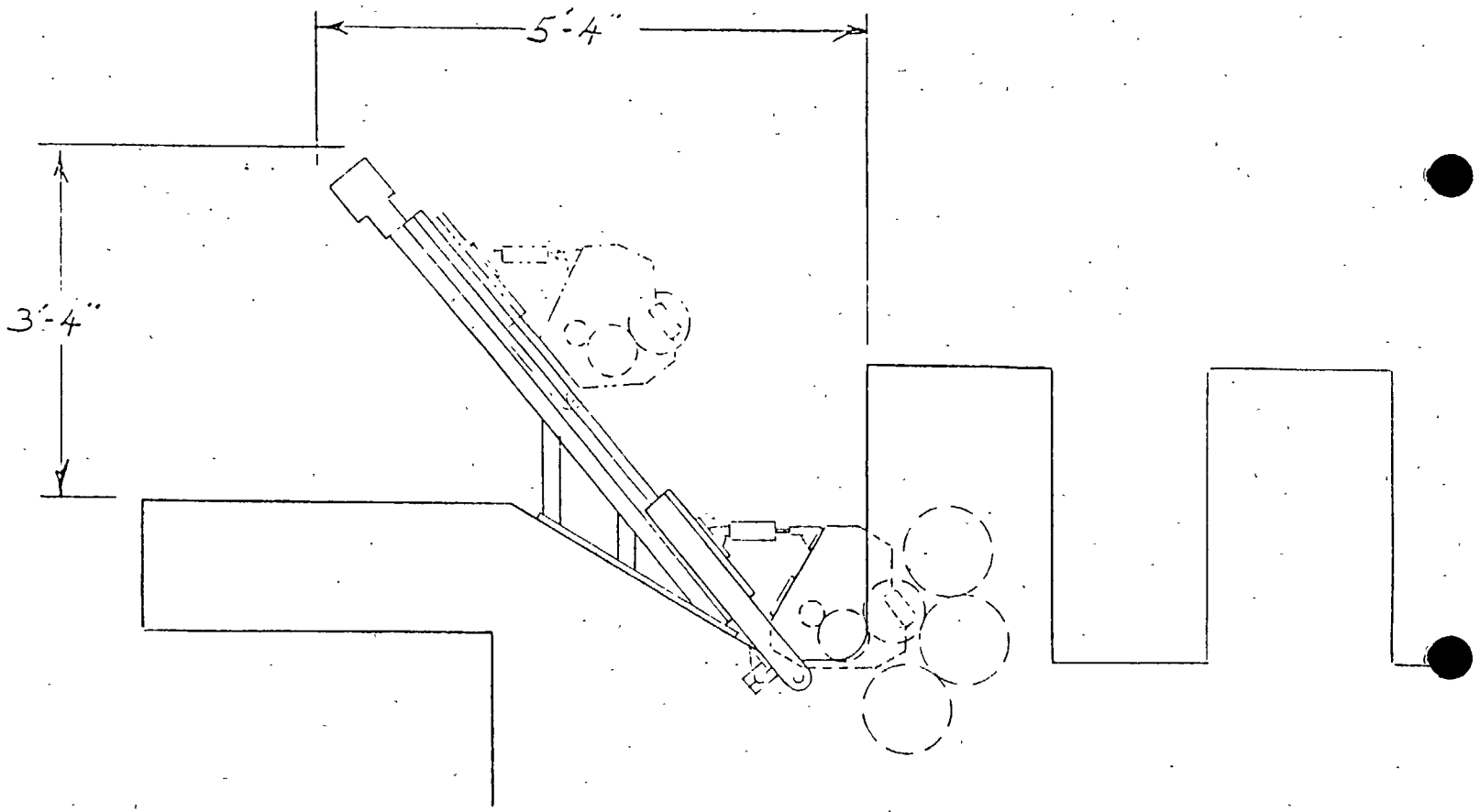


PRESS

MILLER 41"

RAPIDAC BLANKET COATER

MODEL NO. A-2002

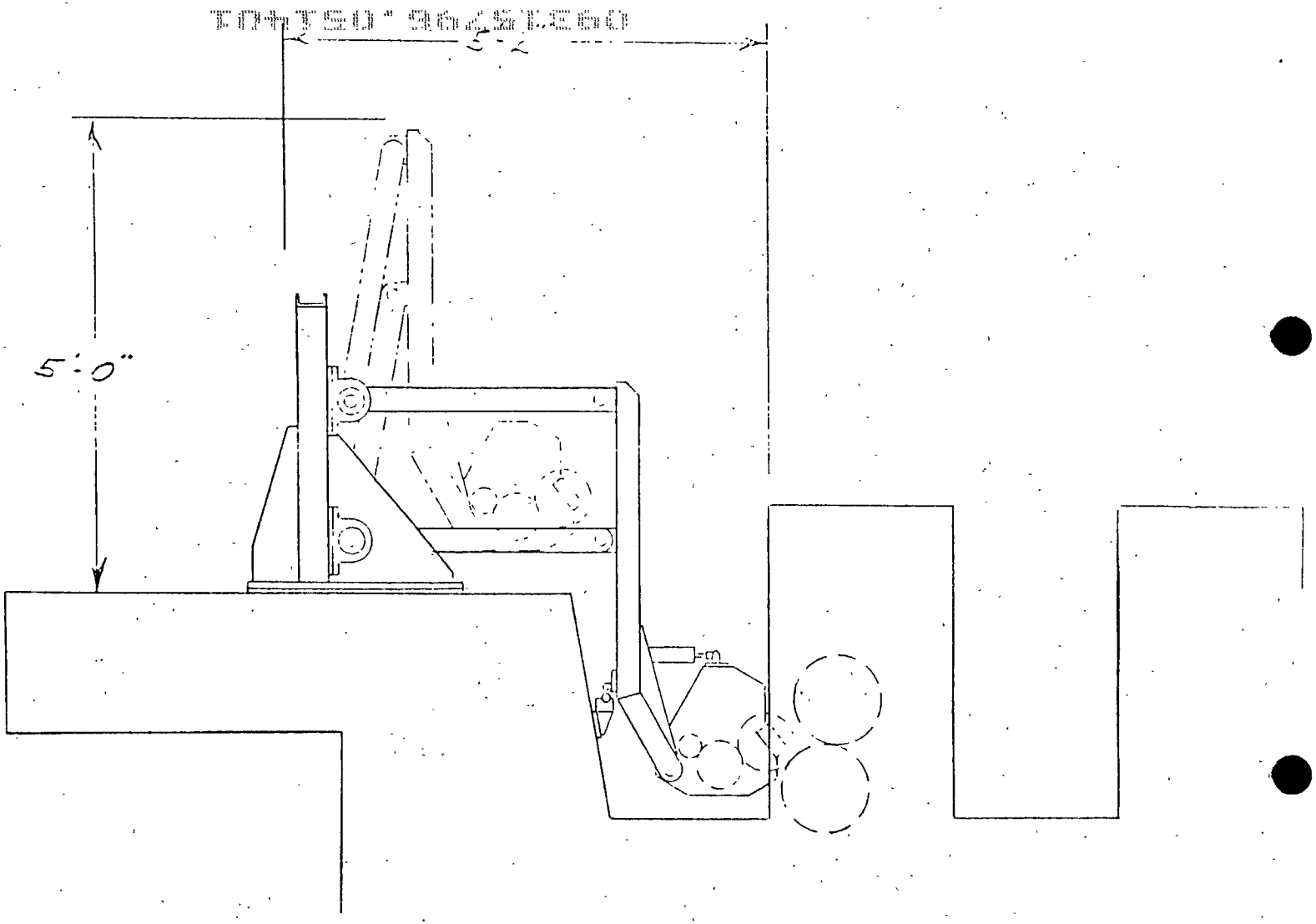


PRESS

HEIDELBERG 40"

RAPIDAC BLANKET COATER

MODEL NO. A-2003

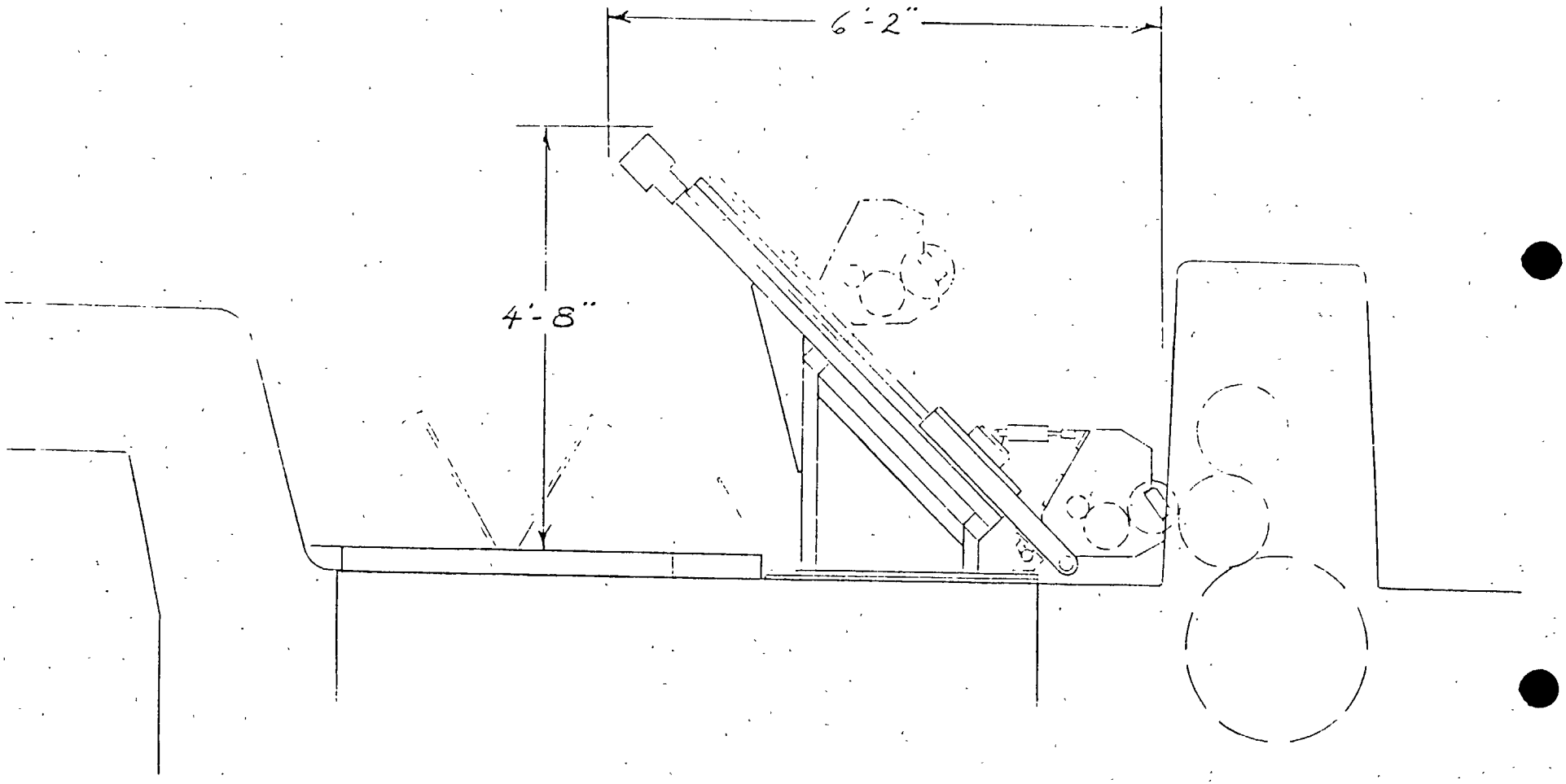


PRESS

KOMORI 40"

RAPIDAC BLANKET COVER

MODEL NO. A-2006

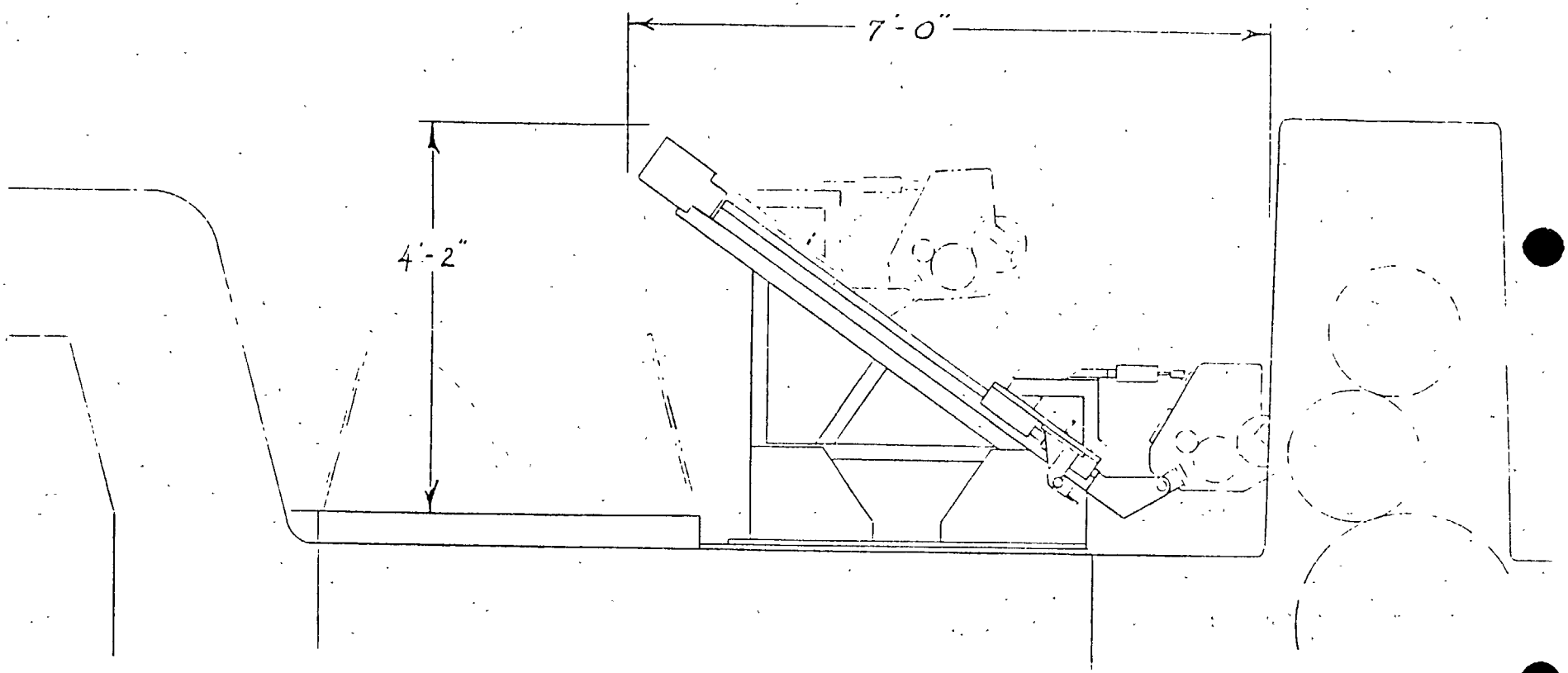


PRESS

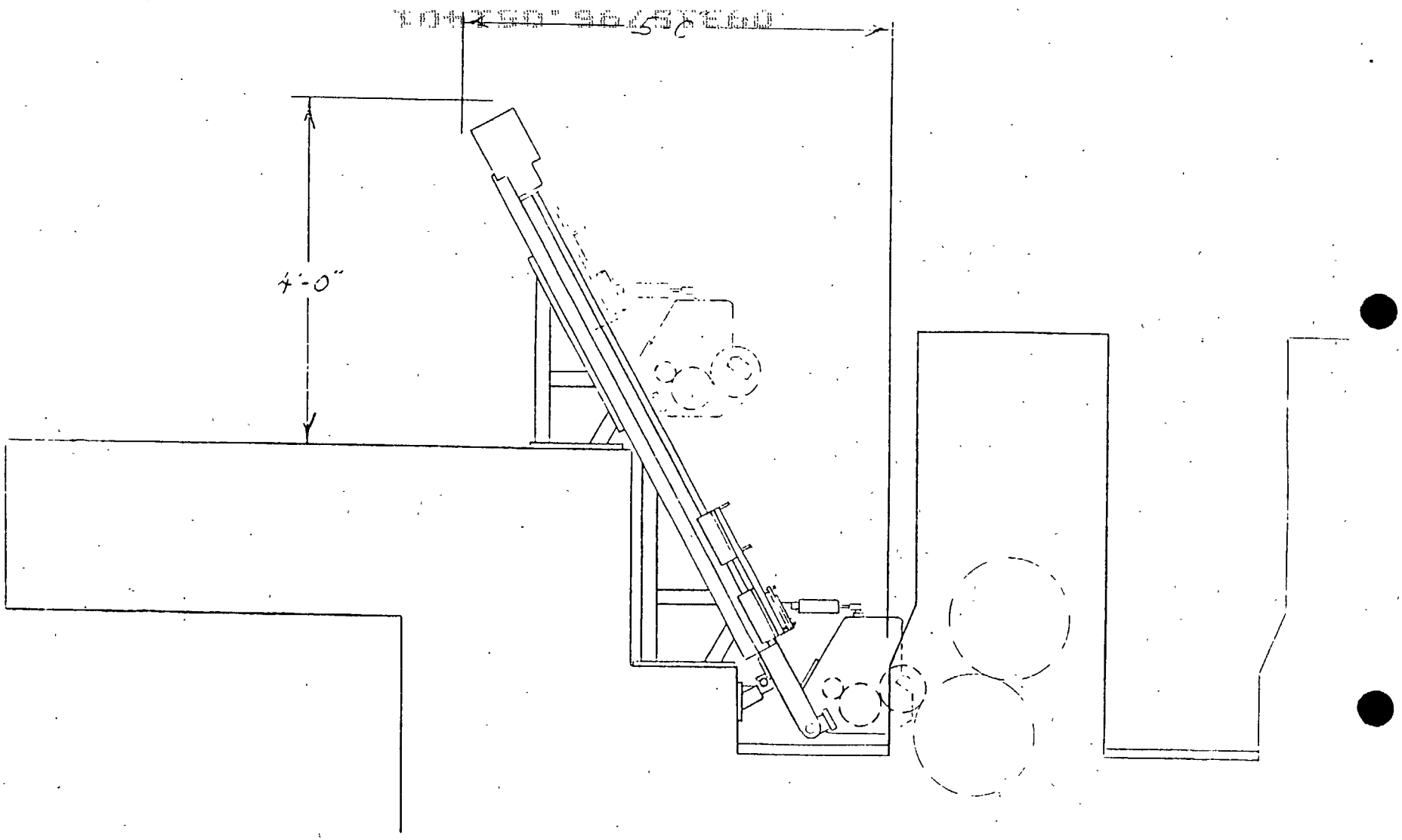
PLANETA 40"
WITH EXTENDED DELIVERY

RAPIDAC BLANKET COATER

MODEL NO. A-2009



PRESS	RAPIDAC BLANKET COATER
PLANETA 50" WITH EXTENDED DELIVERY	MODEL NO. A-2012
PLANETA 55" WITH EXTENDED DELIVERY	MODEL NO. A-2015
PLANETA 64" WITH EXTENDED DELIVERY	MODEL NO. A-2018

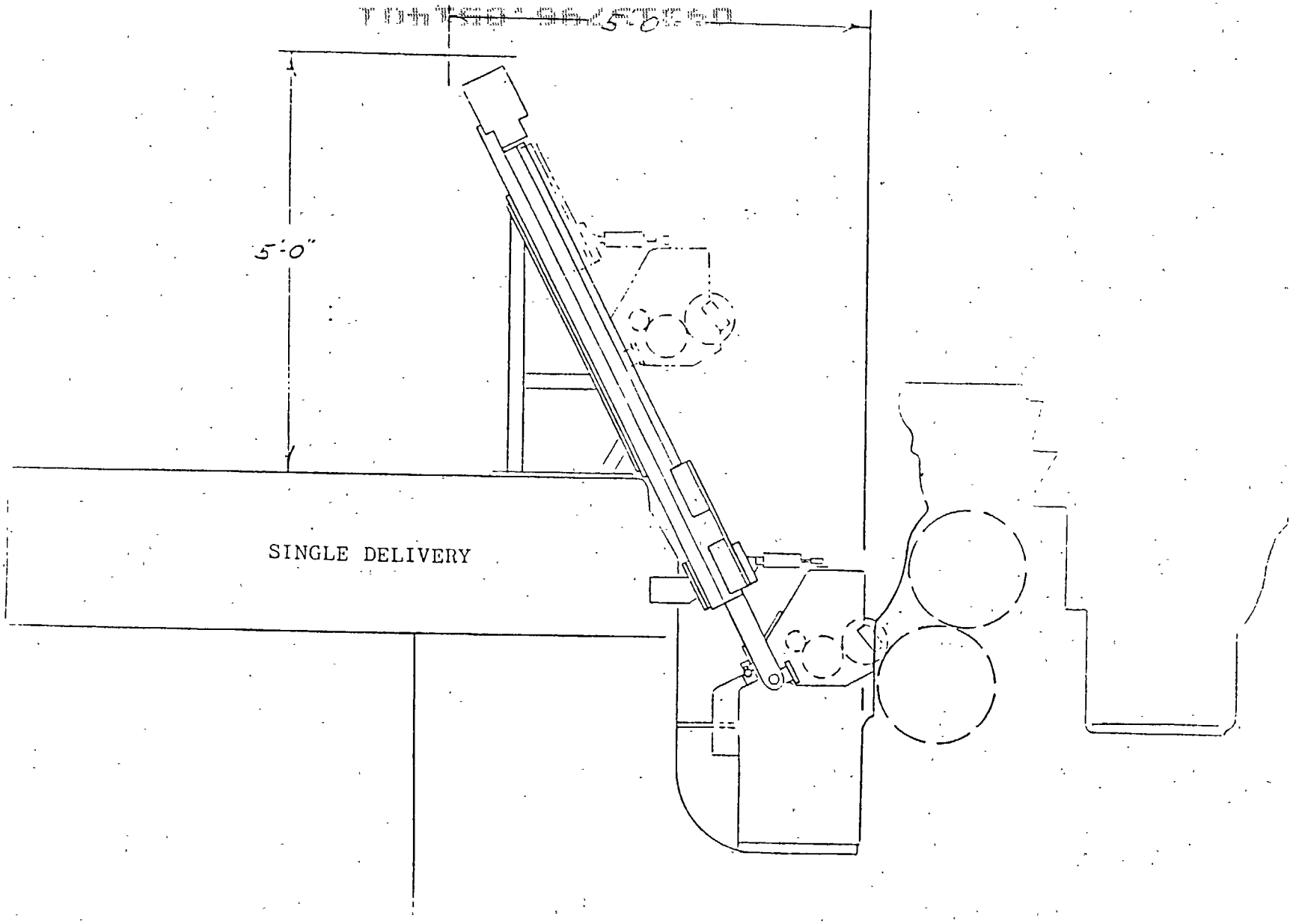


PRESS

MIEHLE 60"

RAPIDAC BLANKET COATER

MODEL NO. A-2021

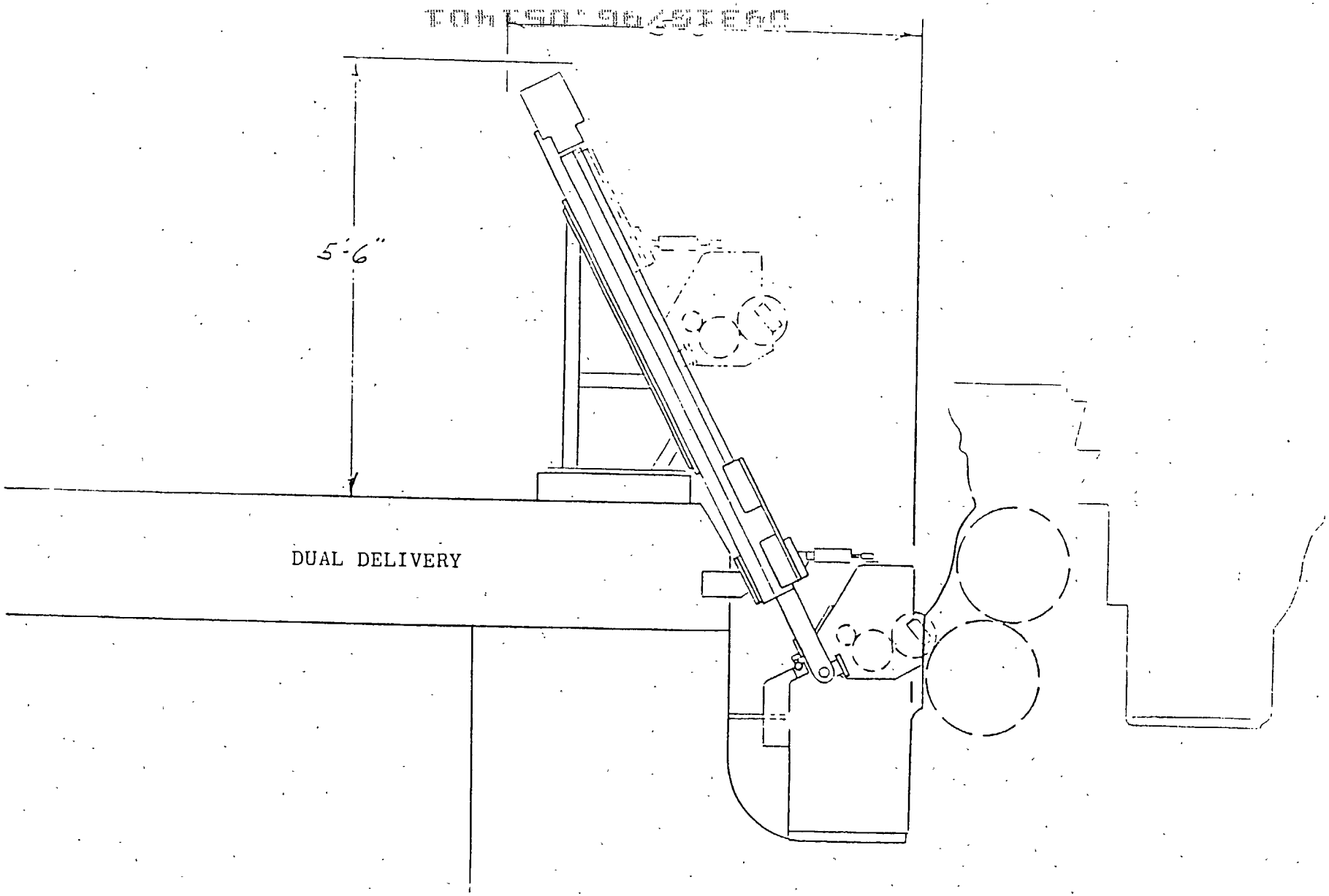


PRESS

HARRIS 60" EARLY MODEL (SINGLE DELIVERY)

RAPIDAC BLANKET COATER

MODEL NO. A-2024

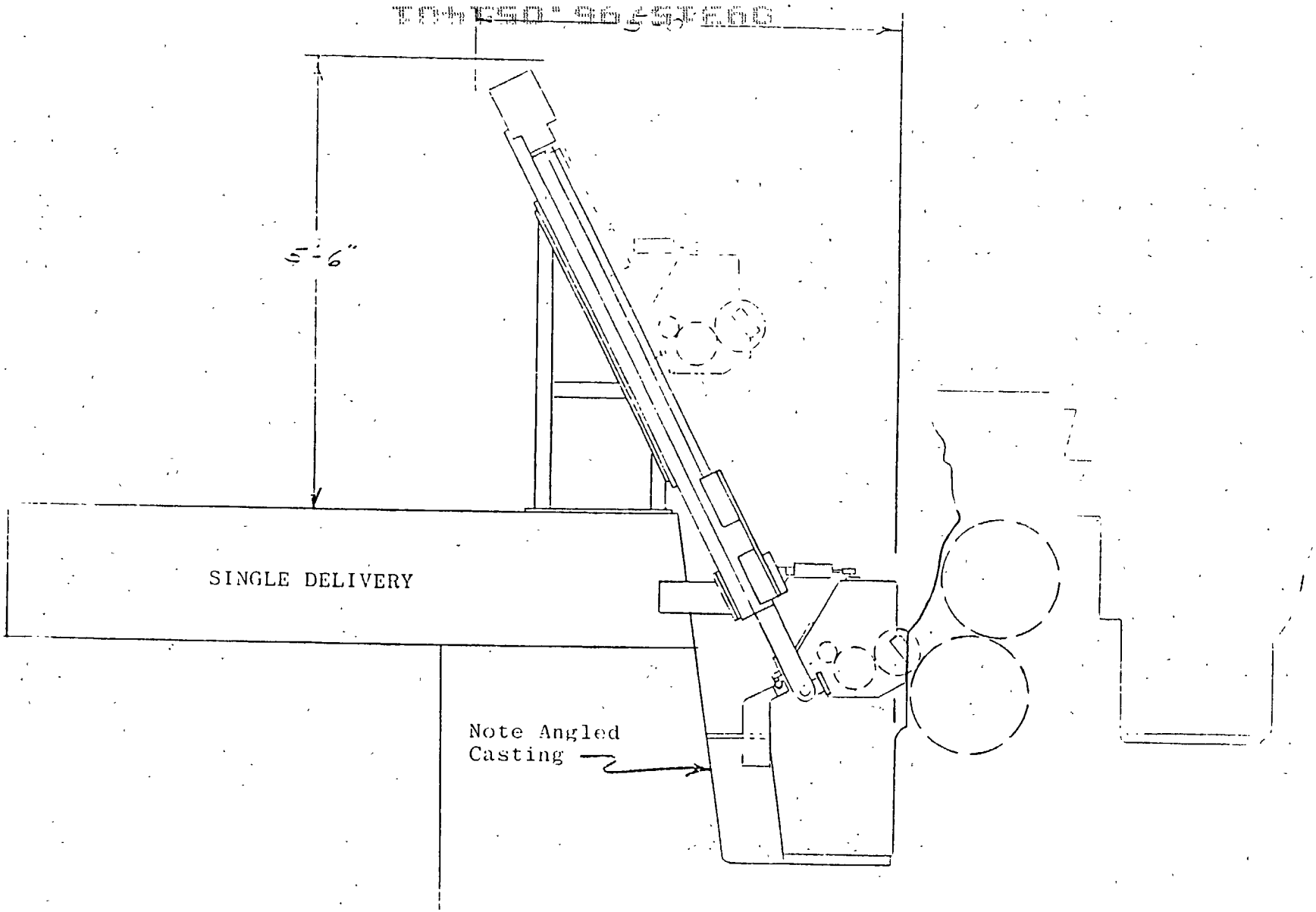


PRESS

HARRIS 60" EARLY MODEL (DUAL DELIVERY)

RAPIDAC BLANKET COATER

MODEL NO. A-2028

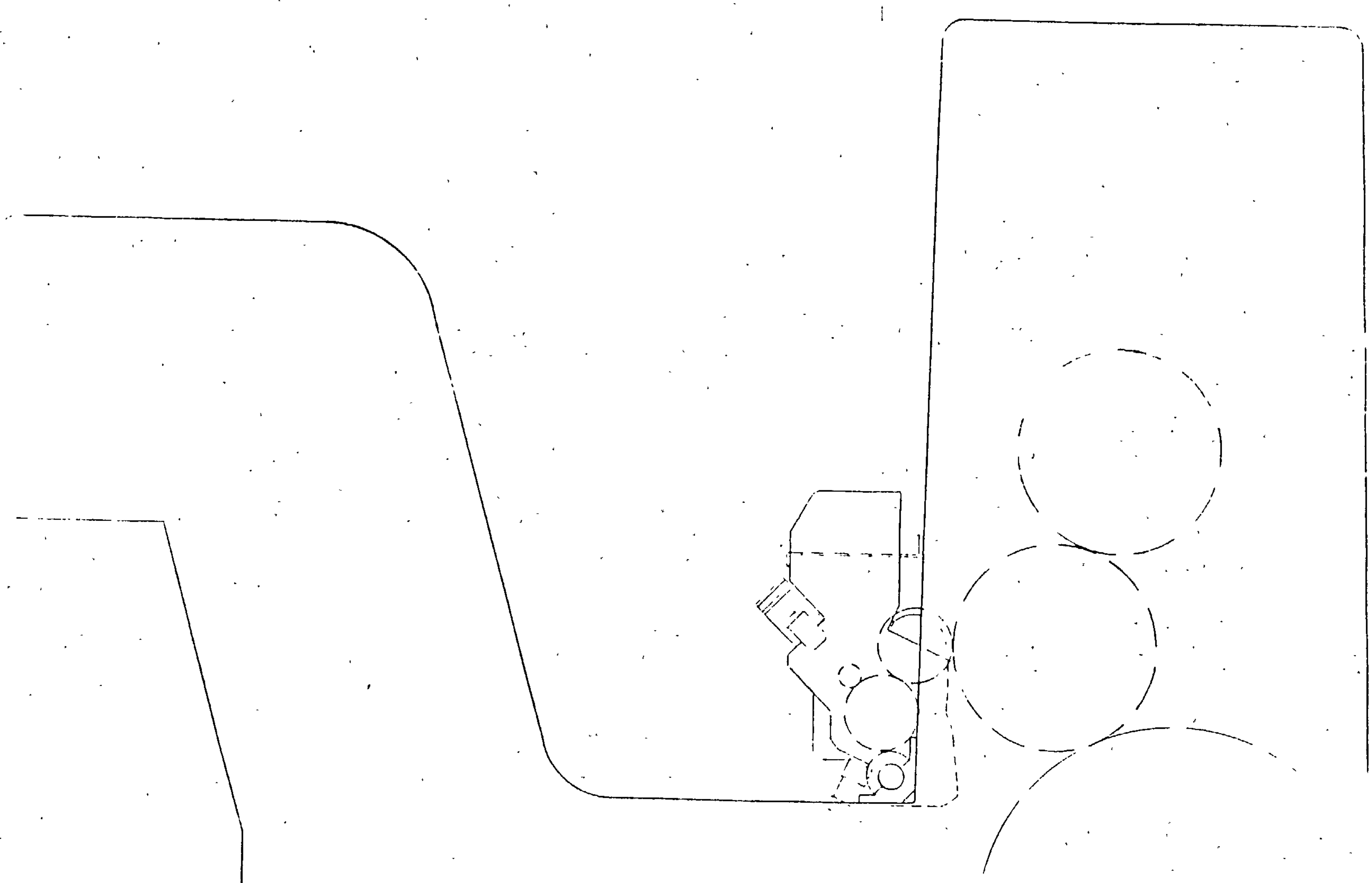


PRESS

HARRIS 60" LATE MODEL (SINGLE DELIVERY)

RAPIDAC BLANKET COVER

MODEL NO. A-2029



PRESS	RAPIDAC BLANKET COATER
PLANETA 50"	MODEL NO. A-2031
PLANETA 55"	MODEL NO. A-2033
PLANETA 64"	MODEL NO. A-2035

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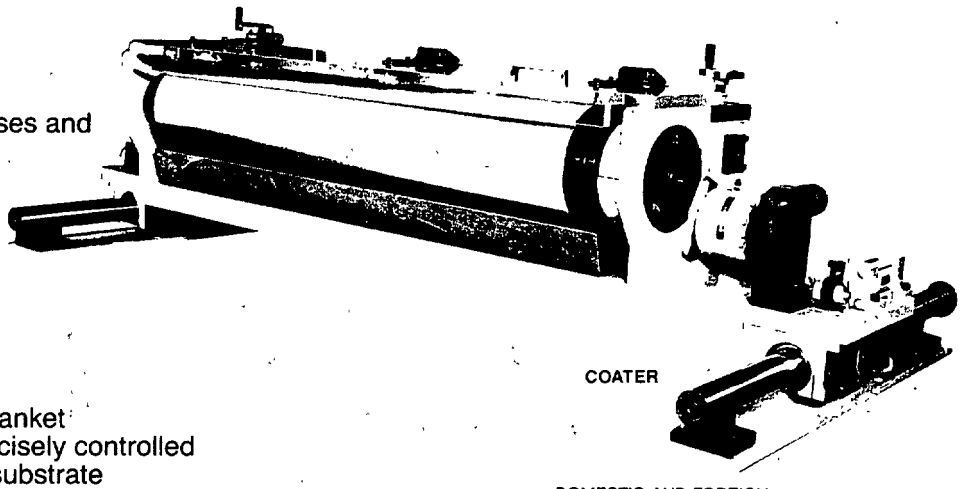
DAHLGREN®

Product Data Bulletin

Blanket Coater



COATER

DOMESTIC AND FOREIGN
PATENTS ISSUED AND PENDING

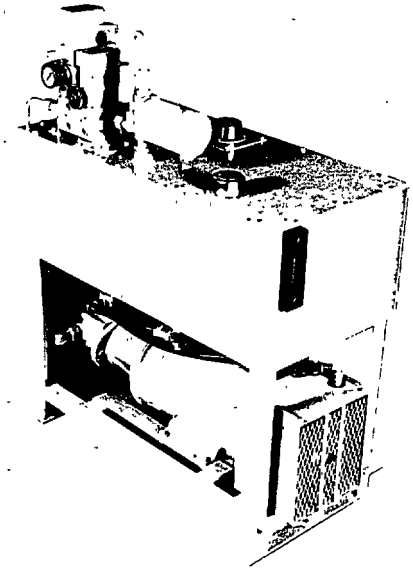
FOR:
The coater is designed for retrofit on new or existing offset SHEET-FED presses and may be used for both in-line (wet-trap) as well as off-line (dry trap) applications.

The Blanket Coating unit is used in conjunction with the last printing station of the offset press to apply protective, high gloss and blister seal coatings over wet or dry surfaces, with optimum efficiency.

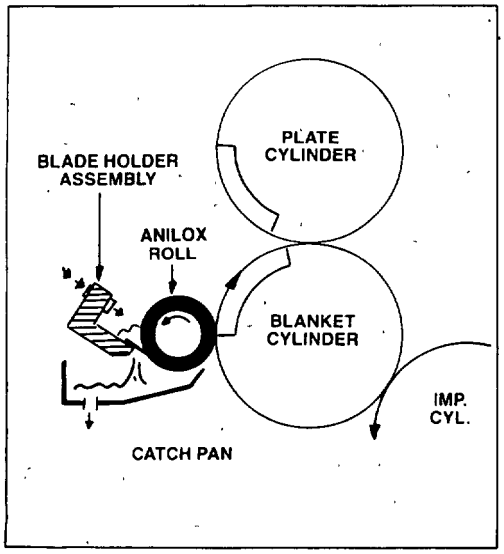
Coatings are delivered to the offset blanket directly from a gravure cylinder in precisely controlled amounts and then transferred to the substrate with a high level of uniformity and consistency.

Various types of coatings can be used interchangeably with the coater including aqueous and U.V. curables. Substrates of varying nature such as paperboard and plastics may also be used.

The entire Coating System consists of the coater, coating supply and circulating system, plus a drying system. (See separate data sheets for dryers.)



HYDRAULIC
DRIVE UNIT



SCHEMATIC DESCRIPTION:

Coating is accomplished with a single gravure roll in pressure contact with an offset press blanket. Coating on the blanket is then applied to the previously wet (or dry) printed sheet. Enroute to the delivery, the sheet is dried with Dahlgren heating lamps and forced air.

A uniform quantity of coating is continuously offered to the press. While the blade removes excess coating from the surface of the roll, engraved cells (voids) on the surface, carry a pre-selected precise volume of coating to the blanket. Coating removed from the cells by the blanket are replenished upon rotation to a flooded-nip at the blade/roll interface. Coating not removed by the blanket is re-wetted at this nip. Accumulation, starvation, roll run-out, streaks, etc., are non-existent. The roll is positively driven in both "On" and "Off" positions. Fresh coating is continuously circulated through the coater. Coat weight may be varied by varying the speed of the anilox roll.

STANDARD FEATURES

- Rugged, unitized construction for bolt-on adaptation to press frames. Horizontal actuation and retraction from press blanket.

APPLICATOR ROLL ASSEMBLY:

Precision engraved surface (copper, nickel and chrome plated).
Statically and dynamically balanced.
Pre-selected volume carrying capacity meeting specific customer coat weight requirements.
Hydraulically driven at press speed for spot-coating, or, at varying speeds for overall coating.
Mounted in heavy-duty, oversized, anti-friction bearings.
Accurately positioned and positively forced (locked) against press mounted "ON" stops. Automatic on-off w/press impression circuit.

DOCTOR BLADE HOLDER ASSEMBLY:

Cast iron holder.
Adjustable pressure capability of blade to coater roll with "Max" pressure limiting stops.
Flexible, replaceable, "blue-steel", hardened and tempered doctor blade; ground doctor surface.
Fixed-angle "wiping" design for doctor blade.

- Coating catch pan under blade holder and coating roll.
- Electrical probes sensing coating flow and level at coater inlet and in catch pan.
- Hinged, aluminum tread plate over blade holder assembly and coating roll. Serves as bench when cleaning or changing blanket
- Hydraulic power unit, pre-plumbed and tested with 20 gallon reservoir and 5 H.P., TEFC motor and fixed displacement pump. Flow-control valves for hydraulic motor and actuation cylinders at coater unit.
- Unit control station with oil-tight enclosure and operator devices.
- "NEMA 12" power control cabinet with control circuit isolation transformer.

CIRCULATION SYSTEM:

Feed and return, constant displacement pumps.
Variable air drive to pumps.
Positive drain and return of coating to drum.
Quick-disconnects at coater head, catch pan and supply drum.
Quick-disconnects for customer furnished wash-up lines.
¾" I.D. flexible, vinyl tubing.

BENEFITS:

System performance (coater + dryer) guarantees.
Operational simplicity, low maintenance, long life, safe.
Short make-ready and clean-up.
Ready access to press blanket when coater is not in use.
Applies precise, consistent quantity of coating; repeatable.
Coating is smooth, uniform and has high rub resistance and gloss.
Elimination of spray powder and associated problems.
Positive "ON", no bounce in cylinder gap (streak-free).

OPTIONAL EQUIPMENT:

- Custom designed coater retraction systems/patented
- Custom designed coating circulation systems
- Viscosity monitor and control
- Ratio speed meter modification

ELECTRICAL/PNEUMATIC INPUT REQUIREMENTS:

230 VAC ± 10%, 3 PHASE, 50/60 HZ ± 2 HZ (25 amps:10 KVA)
400 VAC ± 5%, 3 PHASE, 50 HZ ± 2 HZ (15 amps:10 KVA)
460 VAC ± 10%, 3 PHASE, 60 HZ ± 2 HZ (15 amps 12 KVA)
85-100 PSI Air Pressure; 120 PSI, max.

SHEET-FED PRESSES DESIGNED FOR:

Aurelia	**Harris**	**Marinoni**	**O.M.C.S.A.**
Bobst	**Heidelberg**	**Miehle**	**Planeta (Royal Zenith)**
Color Metal	**Komori**	**Miller**	**Solna**
Crabtree	**M.A.N.**	**Mitsubishi**	**Miehle/Roland (I/C)**
Halm	**Mann**	**Nebiolo**	

WARRANTY SERVICE:

Installation and start-up supervision • 90 day service warranty • 6 months gravure roll warranty • 12 months—other parts warranty

Dahlgren USA, Inc.
P.O. Box 115140
Carrollton, Tx 75011-5140
tel: (214) 245-0035 • wats: 800/527-5301 • fax: (214) 245-0768

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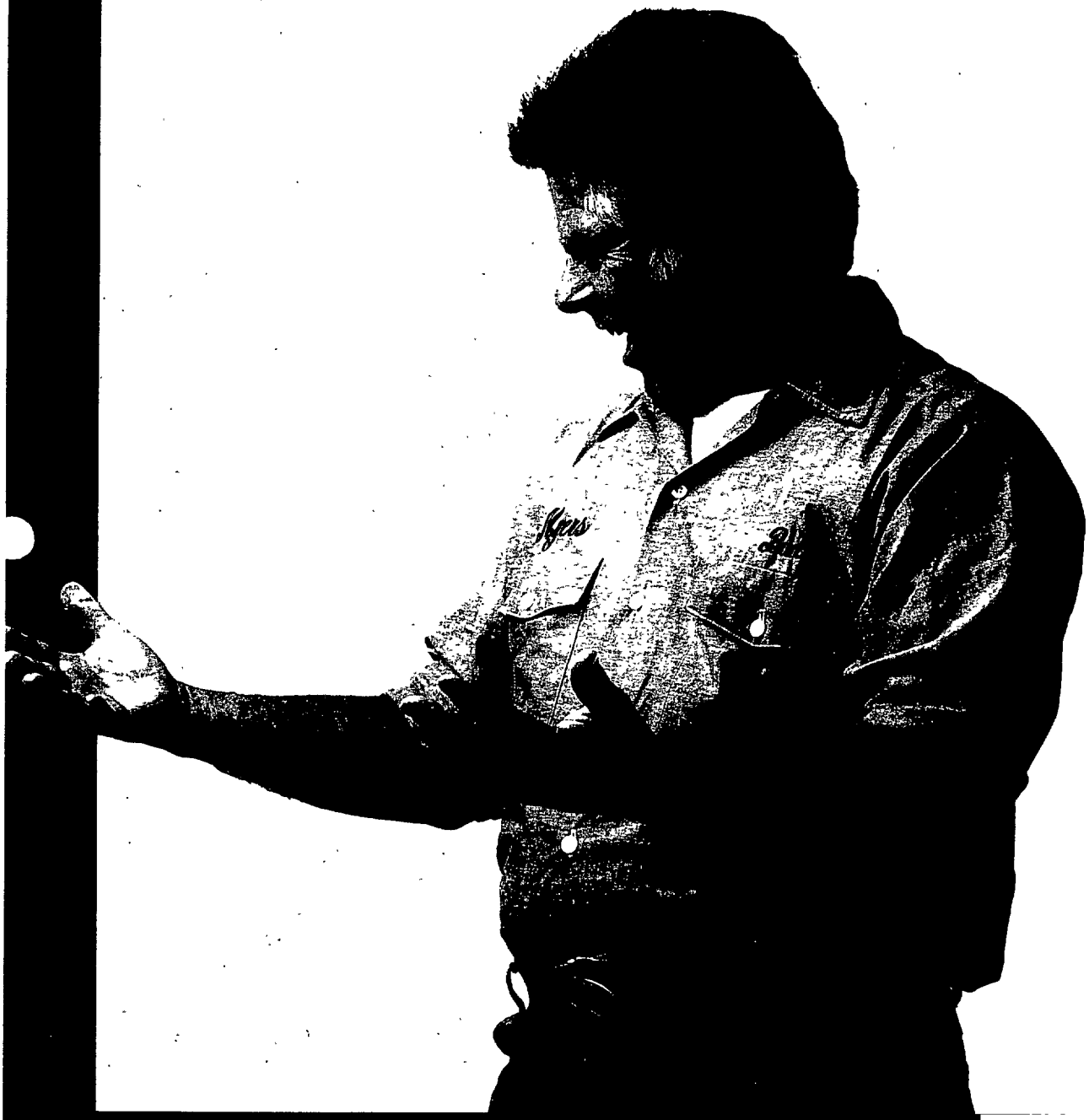
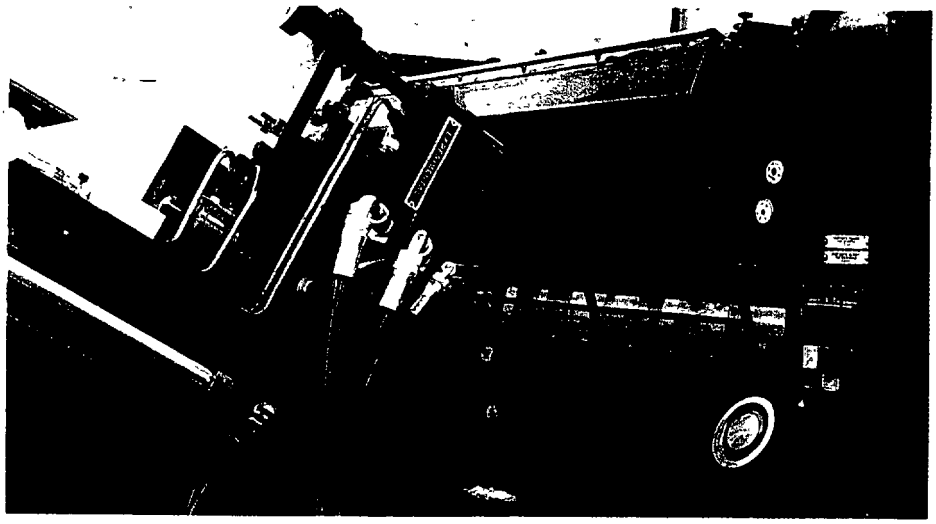
What would you say if we told you you could get 5 impressions out of your 4-color press?

Believe it!



Dahlgren's new LithoPlus Coating System gives you an extra impression on your 2, 4, 5 and 6-color Heidelberg Speedmaster



It sounds incredible. And it should! Until now, no one has been able to print *and* coat in a single pass, without giving up a station. That is, until Dahlgren introduced its new LithoPlus Coating System, designed specifically for the Heidelberg Speedmaster press.

In simplest terms, the Dahlgren LithoPlus Coating System is an add-on blanket cylinder that fits onto the last printing station of your Speedmaster press. With it, you can print and coat in-line, for overall or spot coverage, using U.V., aqueous or varnish coatings. Your customers get added gloss and scuff resistance. Your pressroom dramatically reduces spray powder usage and turnaround time. You save press time, floor space and money.

What's more, you can bill the premium price coating jobs demand, while completing the work in a single pass for better quality. Savings. Quality. Profits. Why hasn't anyone thought of this before?

How the patented Dahlgren LithoPlus Coating System works.

The Dahlgren LithoPlus Coating System was engineered to function as an addition to your Heidelberg Speedmaster press. It is solid, well-designed and compatible with any 40", 28" or CD model. And once it's in place, it never needs to be removed. Just retract the unit when you're not using it, move it back when you're ready to coat. Clean-up and set-up take only a few minutes.

The coater is held in place using a combination of electromagnets and hydraulics, against positive, adjustable stops, that prevent chattering and bouncing. The unit's safe, aluminum add-on cylinder is geared directly to your press, with electrical interlocks to assure proper alignment. When the press and system are turned on, gears drive the coater in synchronization with your press, allowing you to run at full production speeds. Coating and drying occur after the last color application, and coat weight can be varied as desired.

Custom-engineered installation by trained Dahlgren technicians is included in your LithoPlus Coating System purchase. We ensure that your installation meets the precise tolerances of your press. We'll train your people to use the system according to your specifications. And like all Dahlgren products, the LithoPlus Coating System is guaranteed or your money back.

Dahlgren coaters deliver consistent quality, sheet after sheet at your production speeds.

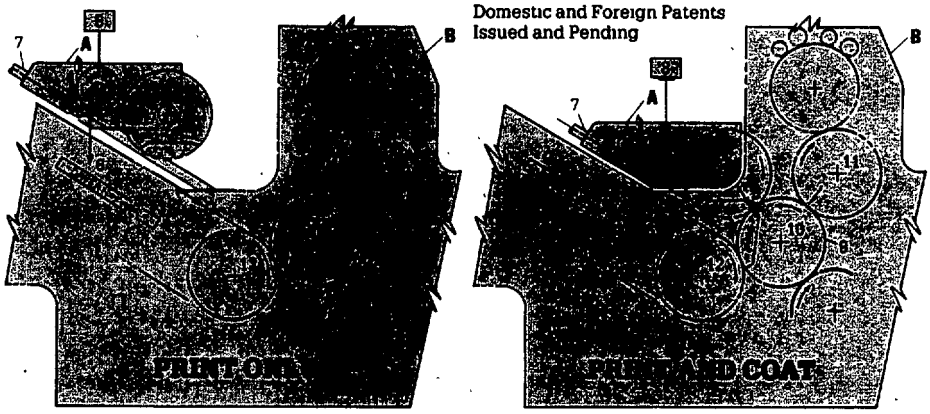
Whether you're running paper, board or virtually any other substrate, your Dahlgren coater will provide uniform coating over your entire run. No slinging, streaking, ridging or unnecessary orange peeling. When you run a Dahlgren, you get total control.

Schematic Description:

Coating is accomplished with a single engraved roll in pressure contact with an add-on coating blanket cylinder. Coating on the coating cylinder is then applied to the previously wet (or dry) printed sheet. En-route to the delivery, the sheet is dried with a Dahlgren drying system and forced air.

A uniform quantity of coating is continuously offered to the coating cylinder and sheet. While the blade removes excess coating from the surface of the roll, engraved cells (voids) on the surface, carry a pre-selected, precise volume of coating to the coating cylinder blanket. Coating removed from the cells by the coating blanket are replenished upon rotation to a flooded-nip at the blade/roll interface. Coating not removed by the blanket is re-wetted at this nip. Accumulation, starvation, roll run-out, and streaks, are non-existent. The coating roll is positively driven in both "on" and "off" positions and can be varied as required. Fresh coating is continuously circulated through the coater.

Domestic and Foreign Patents Issued and Pending



A. COATING MODULE

1. COATING CYL.
2. ANILOX ROLL
3. BLADE
4. COATING (AQUEOUS-UV)
5. COATING CATCH PAN
6. COATING CIRCULATION SYS.
7. RETRACTION SYS.
8. CONTROL STA. & VARIABLE SPEED DRIVE

B. PRESS

9. SHEET
10. IMPRESSION CYL
11. BLANKET CYL.
12. SHEET TRANSFER SYS

See for yourself. Call Dahlgren today!

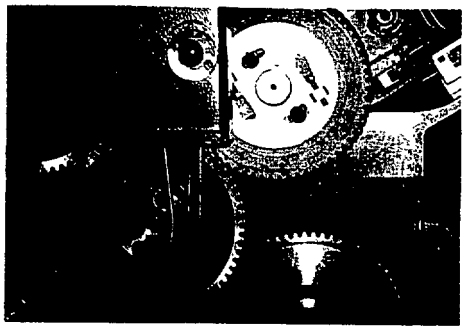
As a Heidelberg Speedmaster owner, you can't afford not to investigate the benefits of Dahlgren's new LithoPlus Coating System. It saves time. It improves the quality of your work. It can make you money.

For information, contact Dahlgren toll-free at 1-800-527-5301 ext. 128 today. Seeing is believing. The LithoPlus Coating System is here!

Dahlgren LithoPlus™ Coating System

Benefits:

- System performance (coater + dryer) guaranteed to your specification. Operational simplicity, low maintenance, long life, safe. Short make-ready and clean-up.
- Ready access to press when coater is not in use.
- Applies precise, consistent quantity of coating; repeatable.
- Coating is smooth and uniform.
- Reduction of spray powder and associated problems.
- Positive "on" no bounce in cylinder gap (streak-free).



System Integration:

- Rugged, unitized construction for bolt-on adaptation to press frames. Hydraulic actuation to and retraction from the press impression cylinder.

Coating Cylinder Assembly:

- Synchronized drive from press.
- Electro/magnetic start up safety provisions.
- Durable construction.
- Adaptable for blankets or photopolymer plate.
- Provision for plate registration.

Applicator Roller Assembly:

- Precision engraved surface (copper, nickel and chrome plated).
- Statically and dynamically balanced
- Pre-selected maximum volume carrying capacity meeting specific customer coat weight requirements.
- Hydraulically driven at press speed for spot coating or variable speeds for varying overall coat weights.
- Mounted in heavy-duty, oversized, anti-friction bearings.
- Accurately positioned and actuated against adjustable "on" stops to coating cylinder.

Printed four colors plus coating in one pass on a four color Heidelberg Speedmaster equipped with a LithoPlus Coater and Dahlgren Dampeners using Sinclair and Valentine inks and Algan coating.

Doctor Blade Holder Assembly:

- Adjustable pressure capability of blade to coater roll with "Max" pressure limiting stops.
- Flexible, replaceable, "blue-steel," hardened, tempered and ground doctor blade.
- Fixed-angle "wiping" design for doctor blade.

Circulation System:

- Feed and return, constant displacement pumps.
- Variable speed air-motor drive to each pump.
- Positive drain and return of coating to drum.
- Quick-disconnects at coater head, catch pan and supply drum.
- Quick-disconnects for customer furnished wash-up lines.
- ¾" I.D. flexible, vinyl tubing.
- Liquid level high/low controls.

Other Features:

- Coating catch pan under blade holder and coating roll.
- Electrical detectors sense coating flow and level at coater inlet and in catch pan.
- Hinged, clear plexiglas cover over blade holder assembly and coating roll.
- Hydraulic power unit, pre-plumbed and tested with 20 gallon reservoir and 5 H.P., TEFC motor and fixed displacement pump. Flow-control valves for hydraulic motor and actuation cylinders at coater unit.
- Unit control station with oil-tight enclosure and operator devices.
- "NEMA 12" power control cabinet with control circuit isolation transformer.

(214) 245-0035
P.O. Box 115140 Carrollton, TX 75011

Call Toll-Free 1-800-527-5301 ext. 128

Optional Equipment:

- Custom designed coating circulation systems.

Electrical/Pneumatic Input Requirements:

- 460 +/– 10% volts AC 3Ø, 60 Hz, 15 amp (12 KVA) Load.
- 230 +/– 10% volts AC, 3Ø, 50-60 +/– Hz, 25 amps (10 KVA) Load.
- 85-100 PSI Air Pressure; 120 PSI, max.

Warranty Service:

- Installation and start-up supervision.
- 90-day service warranty.
- 6 months anilox roll warranty.
- 12 months all other parts warranty.

One roll outshines them all.

DAHLGREN

Printed in Canada 1990

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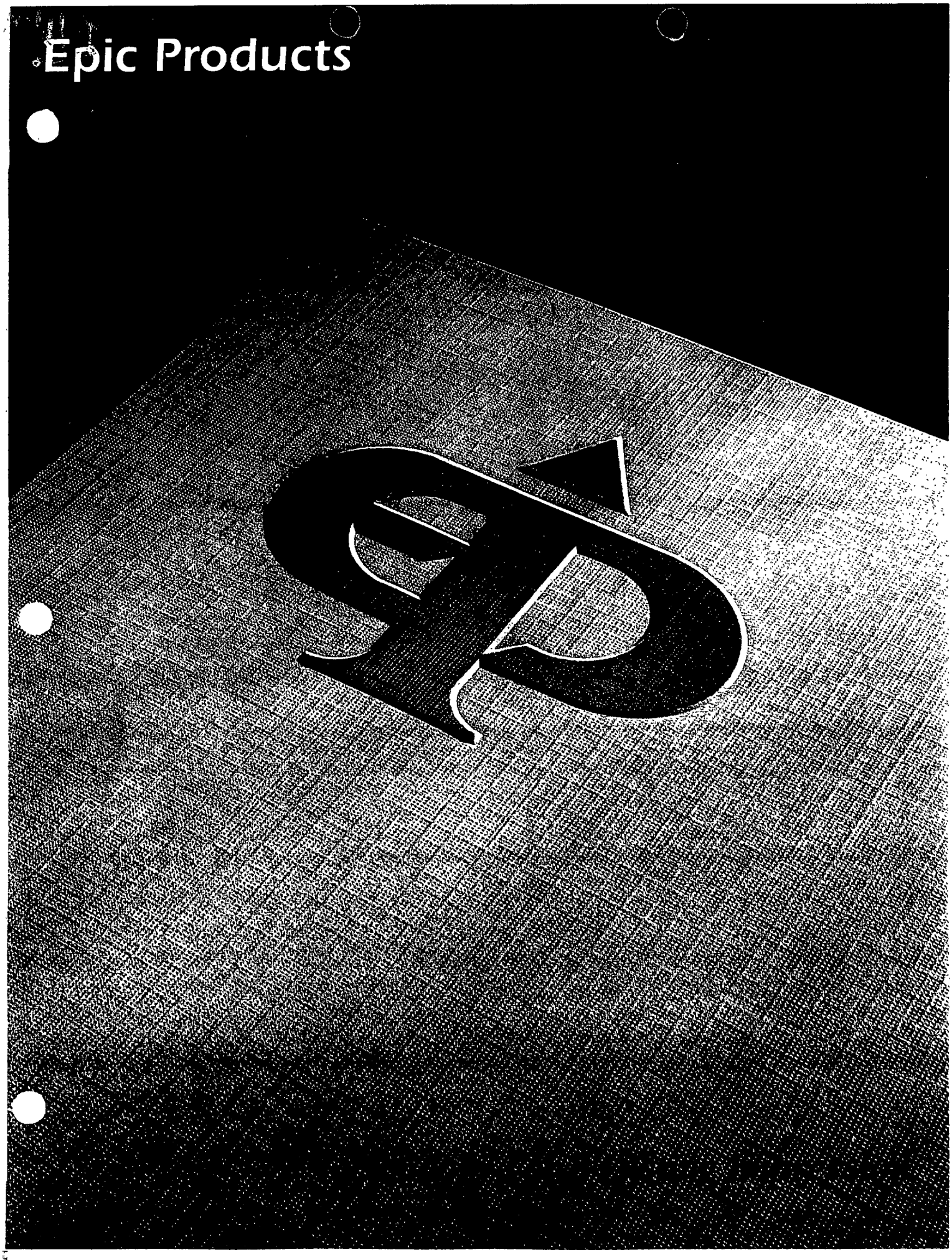
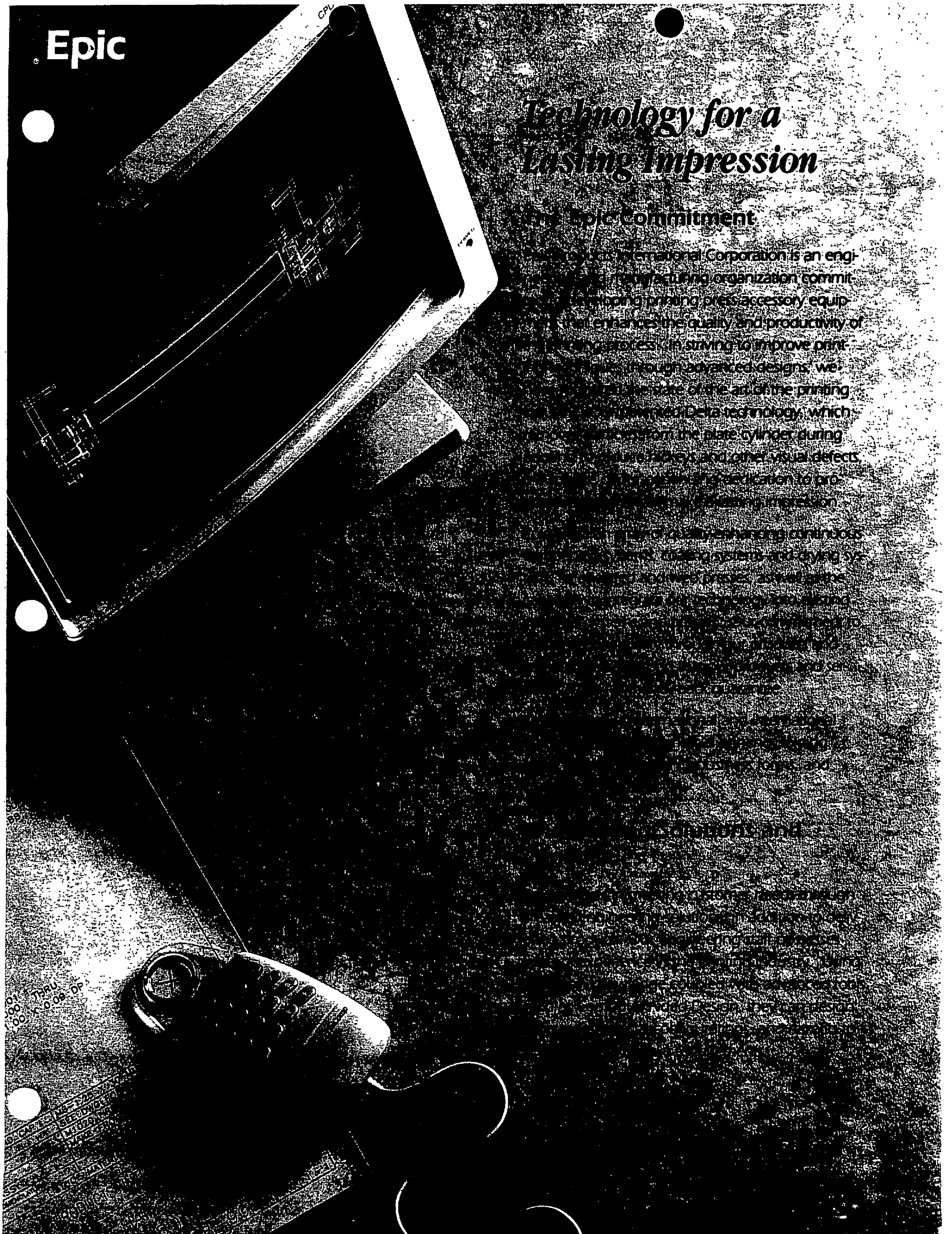
Epic Products



Epic



Technology for a Lasting Impression

[illegible] Epic Commitment

[illegible] International Corporation is an engi- [illegible] manufacturing organization commit- [illegible] printing press accessory equip- [illegible] that enhances the quality and productivity of [illegible] process. In striving to improve print- [illegible] through advanced designs, we [illegible] the state of the art of the printing [illegible] Delta technology, which [illegible] from the plate cylinder during [illegible] hickeys and other visual defects. [illegible] dedication to pro- [illegible] impression.

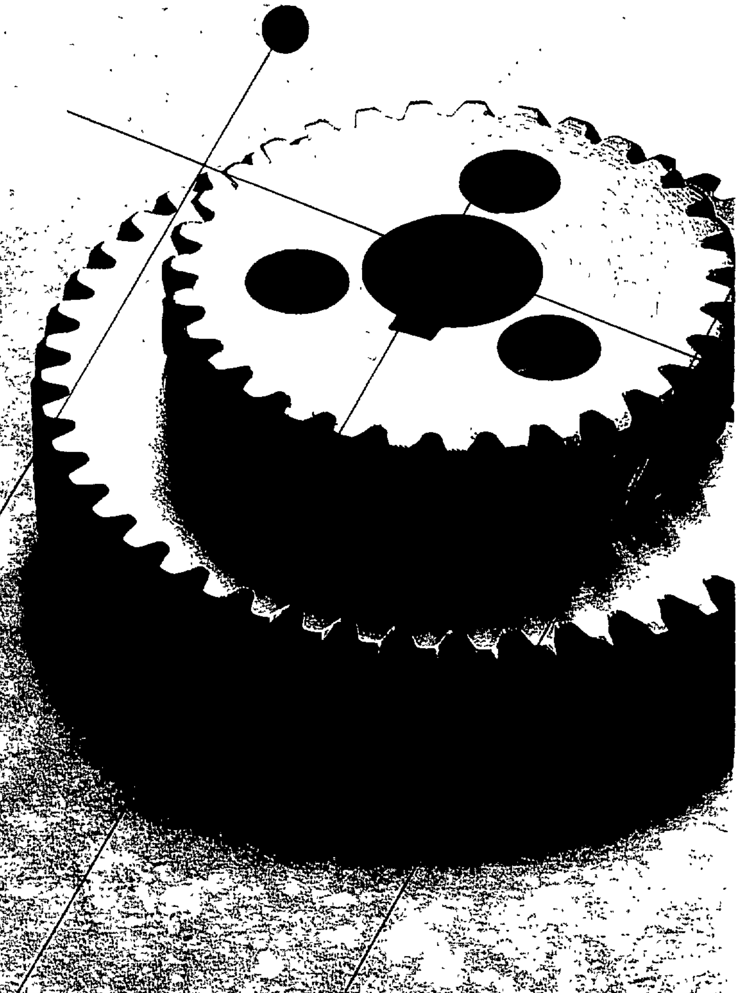
[illegible] of quality-enhancing continuous [illegible] systems and drying sys- [illegible] and web presses, as well as the [illegible]

[illegible] Solutions and [illegible]

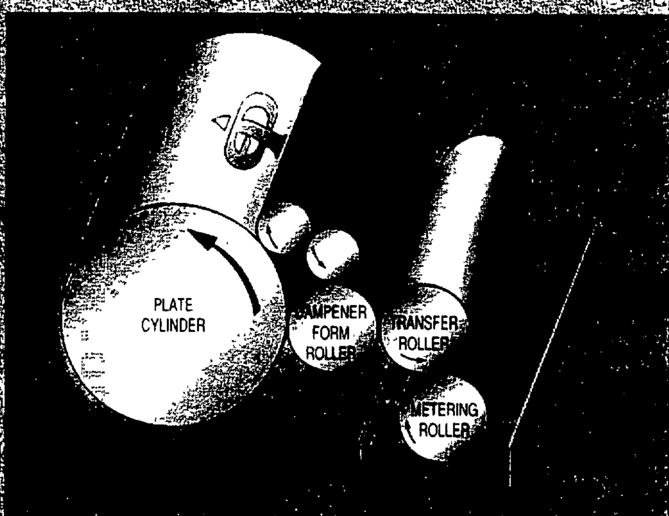
[illegible]

The "Delta Effect"

Breakthrough Technology for Achieving Zero Defects



Epic's patented Delta technology is a revolutionary breakthrough in the prevention of hickeys and other defects during the printing process. A valuable addition to any zero defect program, the unique Delta design utilizes helical gears and positive roller settings to drive the dampening form roller at a slower surface speed than the plate cylinder. This differential motion, called the "Delta Effect," wipes away the foreign particles that cause hickeys, while continually allowing a fresh charge of ink to the plate.



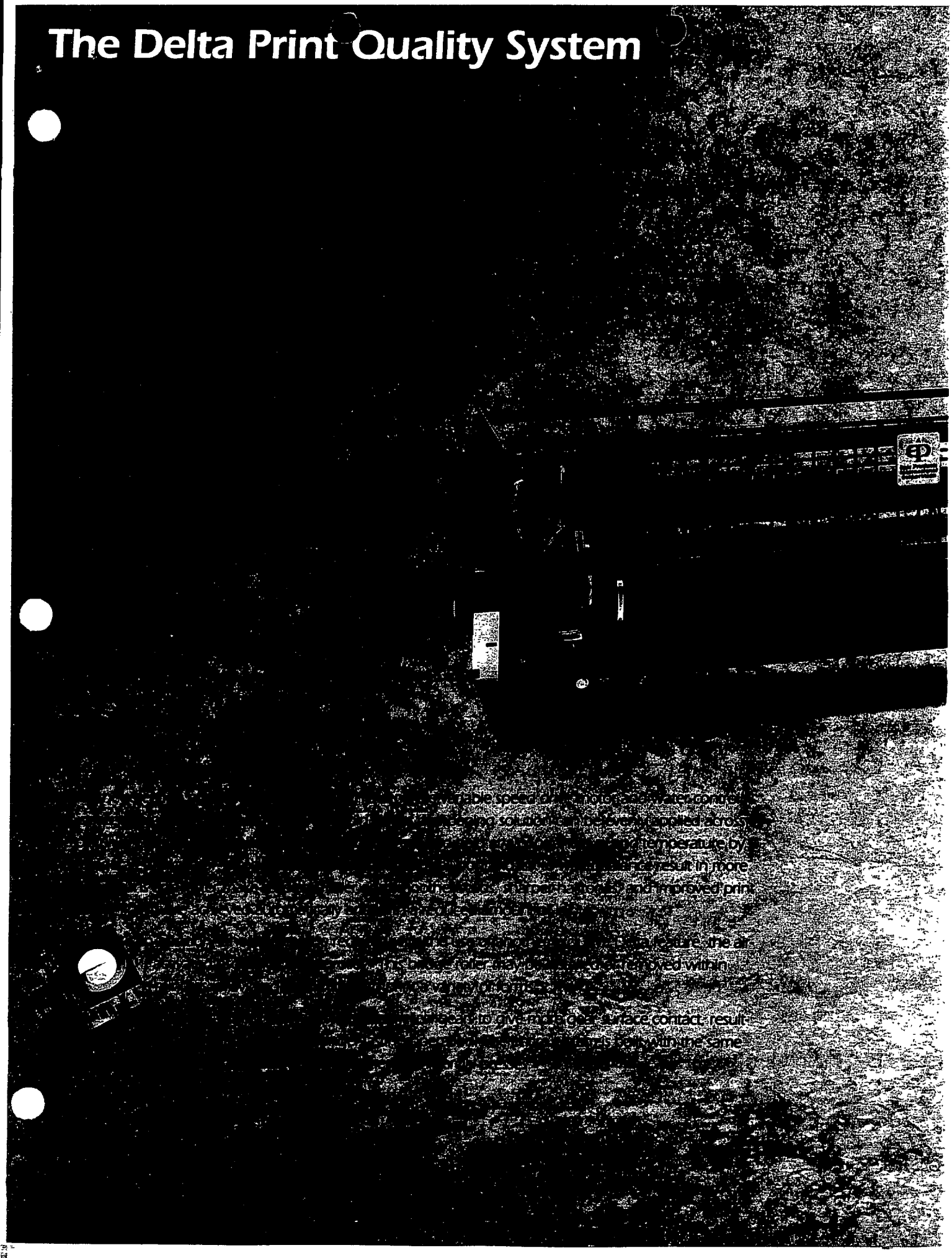
Eliminating Hickeys Once and For All

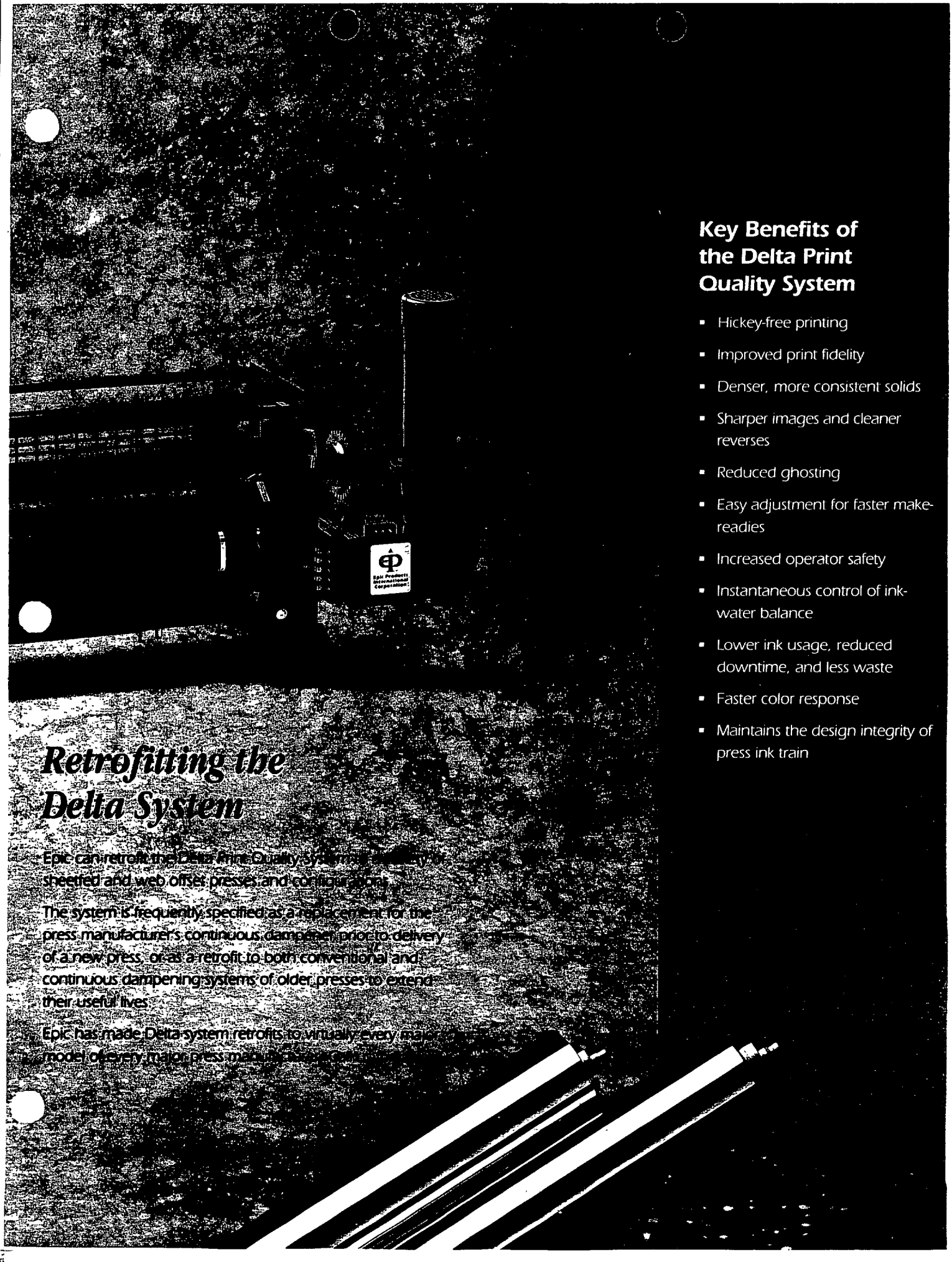
The "Delta Effect" removes virtually all plate-caused hickeys during printing. In fact, the Delta design has been proven so [illegible] that all Delta systems come with a no-risk money-back guarantee [illegible] plate-caused hickeys.

Delta technology [illegible] hickey [illegible] and the time-consuming maintenance that [illegible] and maximize waste by [illegible] the [illegible]

The Delta Design

The Delta Print Quality System





Key Benefits of the Delta Print Quality System

- Hickey-free printing
- Improved print fidelity
- Denser, more consistent solids
- Sharper images and cleaner reverses
- Reduced ghosting
- Easy adjustment for faster make-readies
- Increased operator safety
- Instantaneous control of ink-water balance
- Lower ink usage, reduced downtime, and less waste
- Faster color response
- Maintains the design integrity of press ink train

Retrofitting the Delta System

Epic can retrofit the Delta Print Quality System to virtually every sheetfed and web offset presses and configuration.

The system is frequently specified as a replacement for the press manufacturer's continuous dampener prior to delivery of a new press, or as a retrofit to both conventional and continuous dampening systems of older presses to extend their useful lives.

Epic has made Delta system retrofits to virtually every major model of every major press manufacturer.

Technical Specifications

Delta In-Line Coater/Dampener

The Delta In-Line Coater/Dampener applies a continuous, uniform, metered film of aqueous or U.V. coating directly to the plate cylinder. Positive roller settings ensure precise control of coating transfer. Coat weights can be varied by turning the potentiometer speed control.

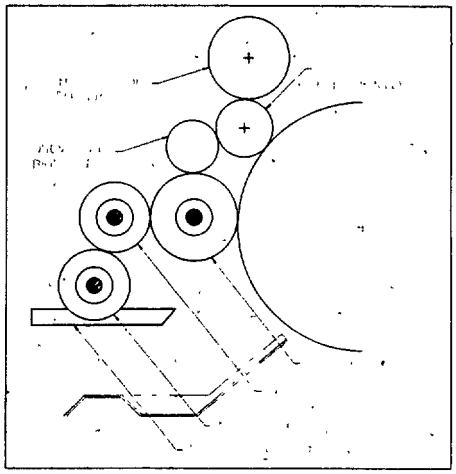
Quick changeover to printing is handled easily. In this mode, the unit functions as Epic's well-known Delta Print Quality System, which combines continuous dampening with the patented differential "Delta Effect" to eliminate hickeys.

For overall coating, a standard offset plate can be used to transfer the coating via the offset blanket to the sheet. Spot coating can be achieved by mounting a relief plate on the plate cylinder. The spot coating image can then be precisely registered by plate cylinder movements, as easily as a printed image.

Specifications include:

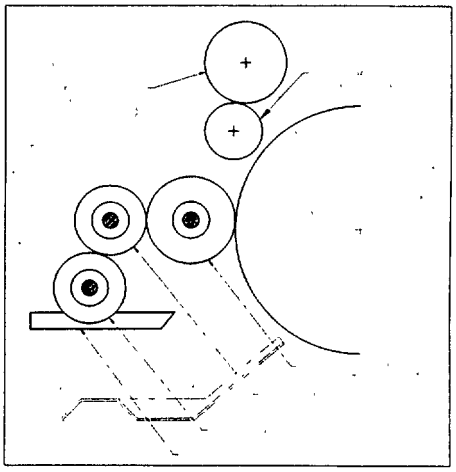
- Resilient covered form and metering rollers
- Motor driven transfer and metering rolls
- Electronic interlink with all press sequences
- Gear driven form roller
- Solid state drive
- Pneumatic actuation
- Refrigerated circulators
- Positive displacement coating pump
- Pneumatically operated oscillating bridge roller

Delta Coater Dampener In Printing Mode



View Looking Inside OS

Delta Coater Dampener In Coating Mode



View Looking Inside OS

Epic Delta In-Line Coater/Dampeners are in use on virtually all types of sheetfed offset presses.

Call 1-817-640-3037

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2801 E. Randol Mill Road • Arlington, Texas 76011 • Phone (817) 640-3037 • Fax (817) 633-3085

EPIC — Technology for a Lasting Impression

Delta Coater/Dampener

Versatility: it's a key factor when you are considering in-line coating technology.

You require precision equipment that provides consistent quality.

You need to be able to change over to printing with ease.

You demand a proven yet cost-effective system . . . from a manufacturer with a reputation of quality performance. You can rely on Epic.

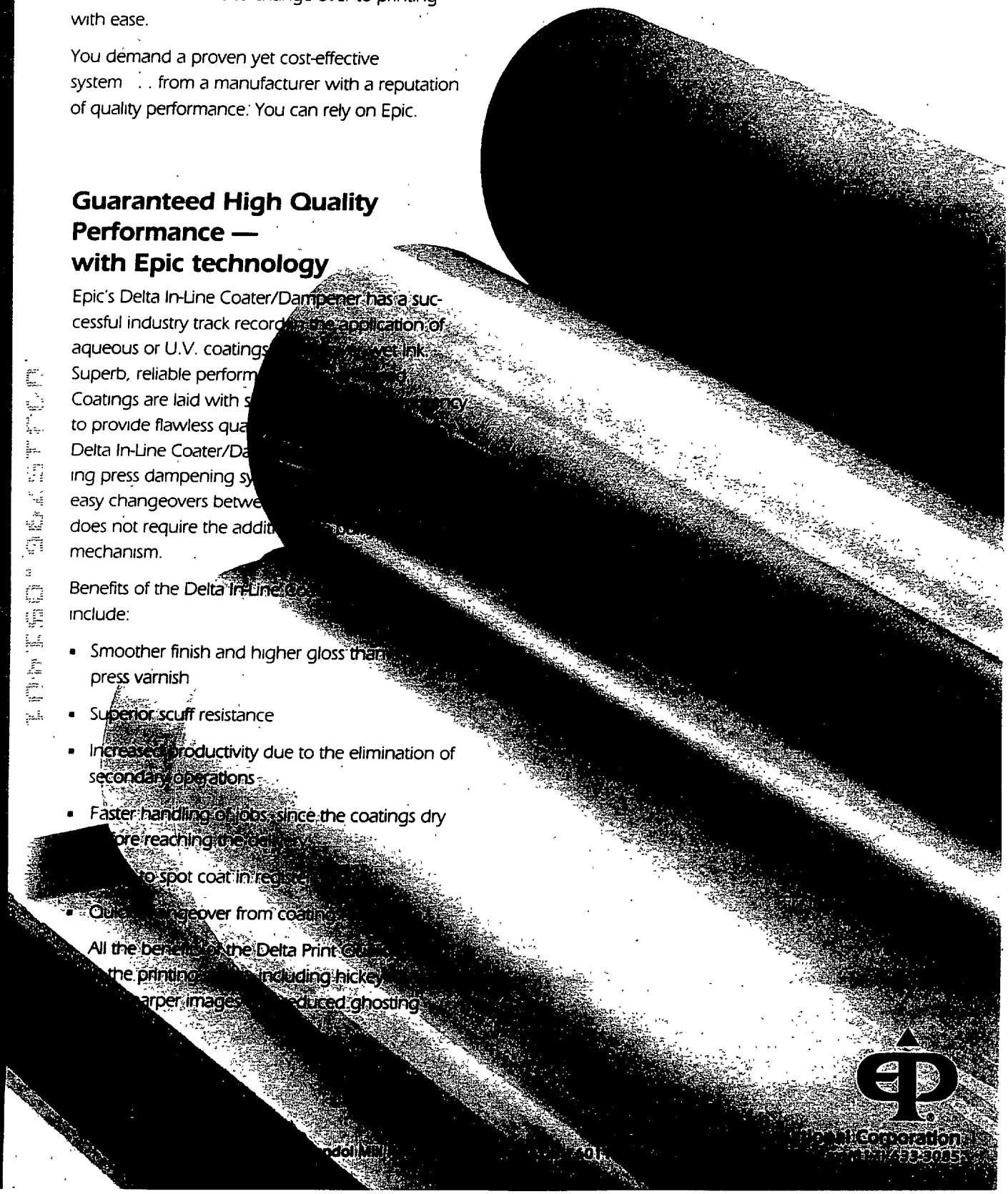
Guaranteed High Quality Performance — with Epic technology

Epic's Delta In-Line Coater/Dampener has a successful industry track record in the application of aqueous or U.V. coatings [illegible] wet ink. Superb, reliable perform[illegible] Coatings are laid with s[illegible]cy to provide flawless qua[illegible] Delta In-Line Coater/Da[illegible] ing press dampening sy[illegible] easy changeovers betwe[illegible] does not require the addit[illegible] mechanism.

Benefits of the Delta In-Line Co[illegible] include:

- Smoother finish and higher gloss than[illegible] press varnish
- Superior scuff resistance
- Increased productivity due to the elimination of secondary operations
- Faster handling of jobs since the coatings dry [illegible]ore reaching the deliv[illegible]
- [illegible]o spot coat in reg[illegible]
- Qui[illegible]geover from coating [illegible]

All the benefits of the Delta Print Qu[illegible] the printing [illegible] including hickey[illegible] [illegible]arper images [illegible]duced ghosting



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Epic Metals Corporation
[illegible]/733-3085

55

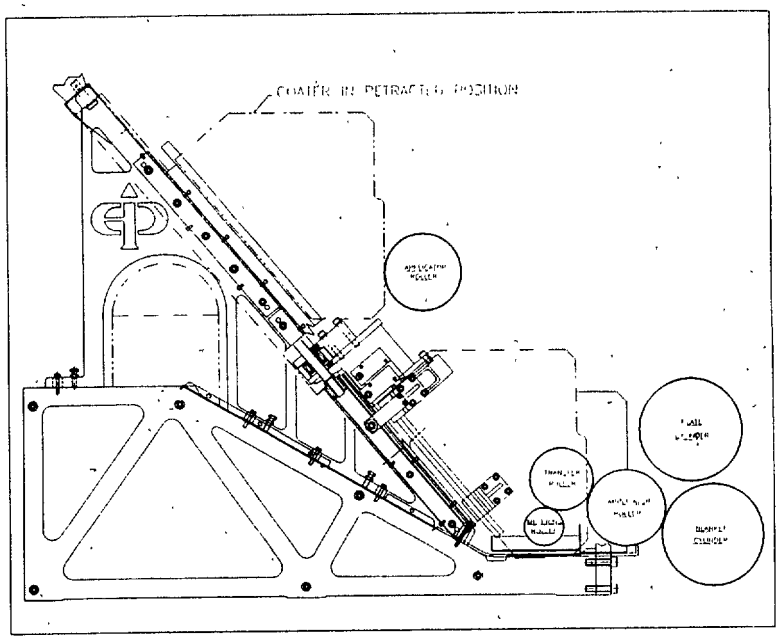
Technical Specifications

Blanket Coater

The Epic In-Line Blanket Coater applies a continuous, uniform, metered film of aqueous or U.V. coating directly to the blanket cylinder. This allows the coating to be transferred directly to the sheet in a smooth, uniform film, either spot or overall.

When used with a suitable curing system (also available from Epic), the coating dries before the sheet reaches the delivery, thereby allowing faster handling of jobs.

The proven three roll design does not require roll changes for various coating weights or varnishes. Partial or full retraction can be provided depending on accessibility requirements.



Specifications include:

- Three roll design allowing application of varying coat weights
- Independent variable speed drives
- Single panel control station for operation of all coating functions
- Stainless steel coating pan
- Positive displacement coating pump
- PLC Logic control for integration with press controls
- Brushless AC motors with inverter drives, designed to follow press speed

The Epic Retractable Blanket Coater can be installed on virtually any type of high pile sheetfed offset press.

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EPIC — Technology for a Lasting Impression

Blanket Coater

In-line coating: it's the wave of the future. Applying coatings in-line, over wet ink, is a faster, more efficient way to enhance your products without the need for varnish or excessive spray powders.

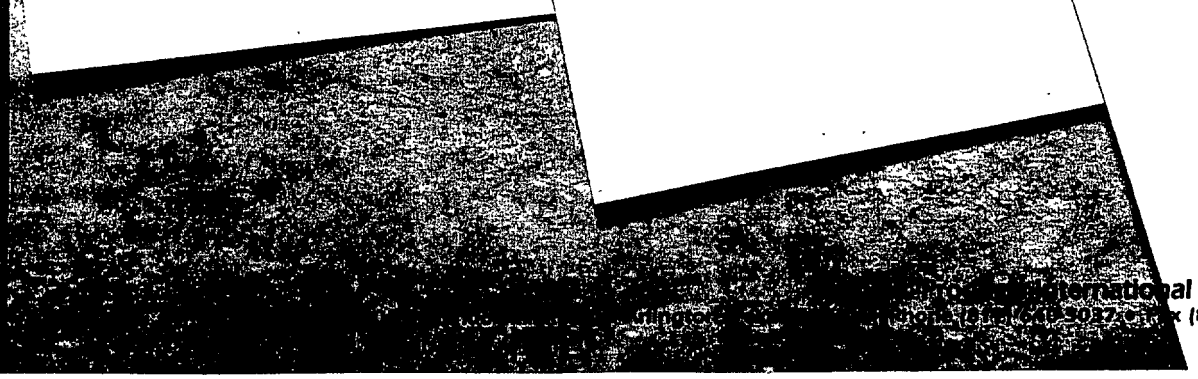
Yet how can you be sure of maintaining quality when you make the transition from traditional varnishing to in-line coating? Can you depend on the newer technology to produce the results your customers expect? And what about flexibility? Epic has the answer.

Reliability, Flexibility and a Superior End Product with the Epic In-Line Blanket Coater

Epic's In-Line Blanket Coater applies coatings in-line with uniform precision, providing a level of quality that can be repeated with consistency. Engineered for reliability, the system is industry-proven in presses around the world. Plus, the proven three-roll design permits the flexibility to apply various coat weights without the need for roll changes.

The Epic In-Line Blanket Coater provides:

- Smoother finishes and higher glosses than that obtained with conventional varnishes
- Superior scuff resistance
- Increased productivity due to the elimination of secondary operations
- Faster make-readies
- Faster handling of jobs, since the coatings dry before reaching the delivery
- Quick changeover from coating to printing

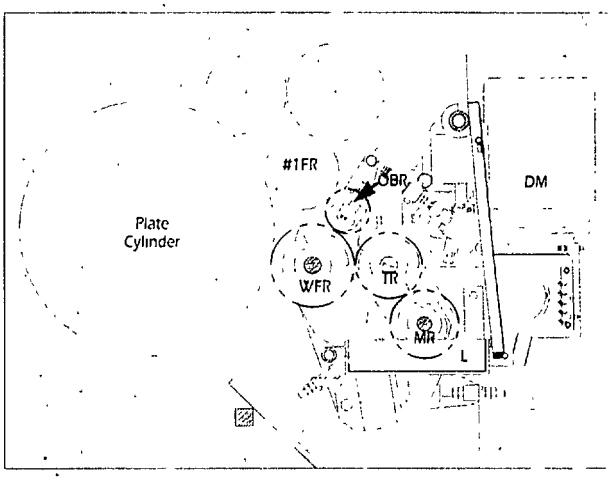


Epic International Corporation
[illegible] (817) 633-3085

Technical Specifications

General Information

- Ink-Water balance achieved quickly with absolute dampener control
- Special Delta Drive Systems
  - Splined, thru hardened steel Delta drive shafts
  - Case hardened, splined steel, helical gearing
- Transfer and metering roller drive gears are case hardened helical gears
- Pneumatically operated oscillating bridge roller
  - The bridge roller can be made to oscillate or the bridge roller can be silent
  - The bridge roller pneumatic system can be run integrated or non-integrated with the push of a button
- Safety systems are standard
  - Safety guards with switches that deactivate unit and press when the guard is raised
  - Nip guards in the inturning nips where cleaning of rollers is required
  - Safety liquid level systems that turn unit off if the liquid level drops below specified levels
- The Delta System prints drier, reducing emulsification in the inker.



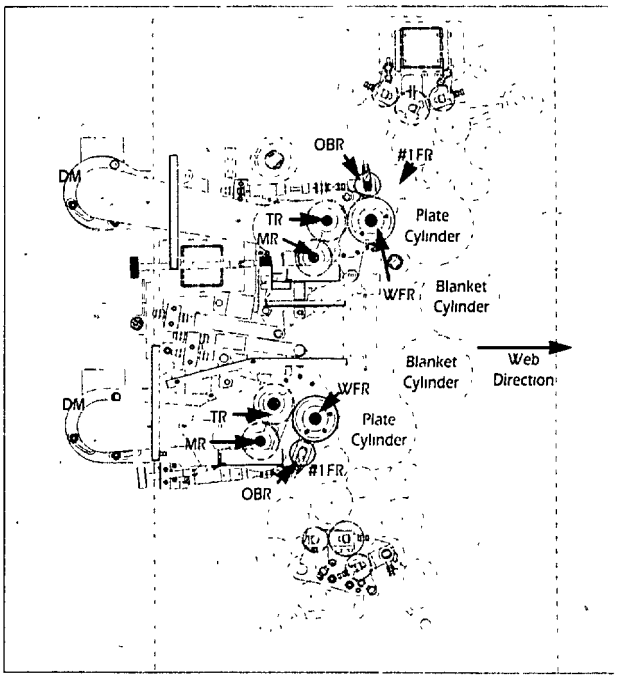
Commercial Sheetfed

#1FR: Number one ink form roller • WFR: Water Form Roller • TR: Transfer (Chrome) roller • MR: Metering (Pan) Roller • OBR: Oscillating Bridge Roller • L: Liquid Pan • DM: Drive Motor

Information on Web Dampeners

All the general items listed above plus these additional items

- The option of automatic lubrication system or integrating the dampener into the existing press automatic lubrication system
- Mirror finished chrome rollers to minimize ink feed back
- Each end of the oscillating bridge roller is covered with a rubber boot to keep contaminates out
- Large capacity spherical roller bearings are designed into each unit
- Brushless AC motors with inverter drives
- PLC Logic allows for
  - Plate pre-wet
  - Speed following with individually trimmed units
  - Auto impression
- Plate following Allows the water form to cock with the plate without having to readjust rollers
- The Delta System prints drier, reducing registration problems caused from paper stretch
- Resilient rollers are covered with high temperature nitrile



Web Perfector

#1FR: Number one ink form roller • WFR: Water Form Roller • TR: Transfer (Chrome) roller • MR: Metering (Pan) Roller • OBR: Oscillating Bridge Roller • L: Liquid Pan • DM: Dampener Drive Motor

Epic can install the Delta Print Quality System as a standard on new presses or as a retrofit.

Call 1-817-640-3037

Epic Products International Corporation

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EPIC — Technology for a Lasting Impression

Commercial and Folding Carton Printing

Today's commercial and folding carton printers face greater challenges than ever before, from using recycled materials to meeting zero defects Every brochure . . every package . . every printed carton must present a lasting impression of quality while winning environmental approvals. To address the varied, often conflicting demands of the day, these printers need highly creative solutions and tools.

Epic can help you print superior materials while reducing press down time, minimizing waste, and saving hours of product inspection.

Giving You the Technology to Achieve Zero Defects with the Delta Print Quality System

Epic's Delta Print Quality System, featuring patented Delta technology, allows sheetfed and web printers to.

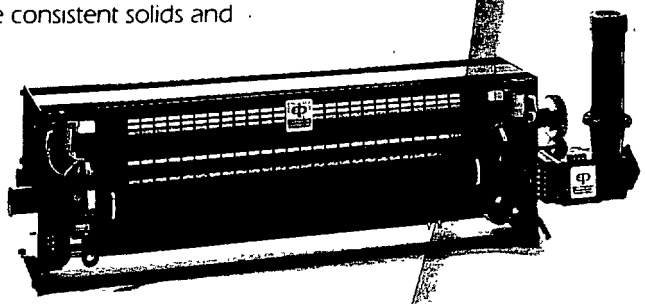
- Guarantee hickey-free printing — with no lost press time
- Reduce ghosting and streaking
- Print sharper images and cleaner reverses
- Gain precise control over ink-water balance — delivering denser, more consistent solids and truer colors
- Reduce waste by decreasing the stops and starts normally associated with hickey removal

"Since our Delta installation, we've gained almost total elimination of hickeys on our six-color press, and our overall quality is better than ever. Customer service has improved, too, since press checks go smoothly. There's no question that the investment was worthwhile."

Mike Patton, President
Creative Press, Inc.
Orange County, CA

"In the past, customers expected boxboard printing to have imperfections We were allowed to have a certain number of hickeys, but we still had to print overruns. It was necessary to visually inspect every sheet in the entire job and sort out the bad ones. Now that we're running Delta, we've eliminated the hickey problem altogether."

Rolf Peterson,
Marketing VP
Royal Paperbox
Montebello, CA



100%, No-Risk Money Back Guarantee

If Epic Delta doesn't remove at least 98% of all plate-caused hickeys we'll buy it back!

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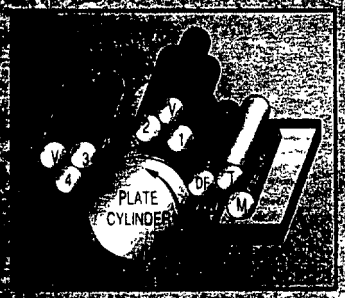
Coating Systems



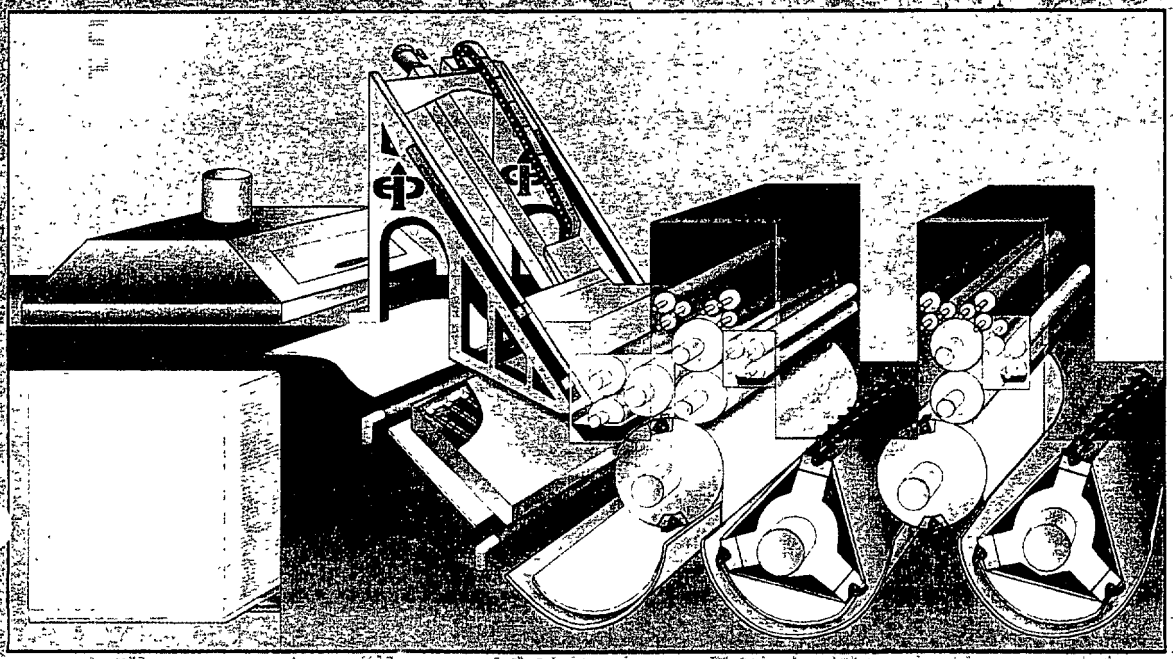
...quick changeovers to the ...ferences as a Delta continu... ...quality, trickey free.

...Blanket Coater

...stable

...press speed.

Epic Blanket Coaters apply aqueous or UV coating to the blanket cylinder of the press, permitting the coating to be transferred directly to the sheet in a smooth overall or spot film. The proven three roll design allows for application of various coating weights or varnishes without the need for roll changes. Epic Blanket Coaters are available in either stationary or retractable versions.

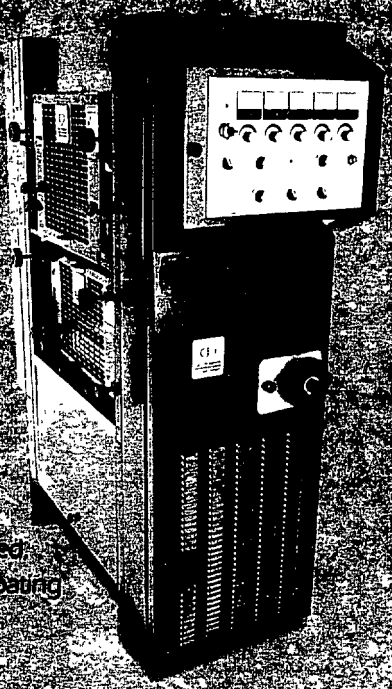


From left to right, this diagram illustrates the Press Delivery Evacuation System, Infrared-Convection Dryer with auxiliary Air Knives, Retractable Blanket Coater, Delta Coater/ Dampener, and Delta Print Quality System. All equipment shown is manufactured by Epic Products.

In-Line Web Coating

Adding Appearance Without Sacrificing Press Speed

Epic's In-Line Web Coaters help to enhance the value of any printed piece by adding attractive, high gloss, rub resistance, oil or moisture resistance coatings in-line, without limiting press speed.



Single or Double Side

The In-Line Web Coater applies coating to either one side or both sides of the web without smearing or set-off. The system can apply a variety of coatings including water-based, solvent-based, catalytic or UV coatings on all types of paper. Regardless of press speed, coating is free of pin holes or streaks. Full or pattern coating systems are available.

The Finishing Touch

IR, UV and Convection Dryers

Epic designs and manufactures custom drying and curing systems for all types of sheetfed presses. Contact us for details.

From hickey-free printing with the Delta Print Quality System, through coating and drying systems . . . on the most basic of single color presses to the most complete multi-color presses . . . encompassing commercial sheetfed and web, folding carton, forms, and metal decorating . . . Epic offers the technology and expertise you need to produce the highest quality printed products

Lasting Support

After every installation, Epic offers continuing support. Updating configurations to changing needs, keeping customers current on new accessories, performing repairs, providing modifications, and training are all part of the Epic package. From helping our customers create lasting impressions to providing lasting service, we are dedicated to keeping our customers' press lines operating at productive, high quality levels.

Printed in the U.S.A. on a 6 color 40" press equipped with the Delta Print Quality System

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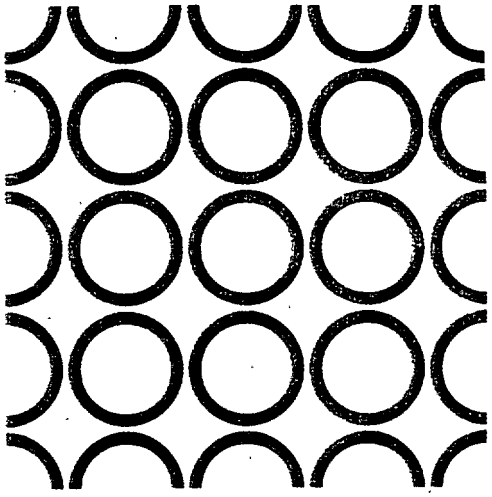
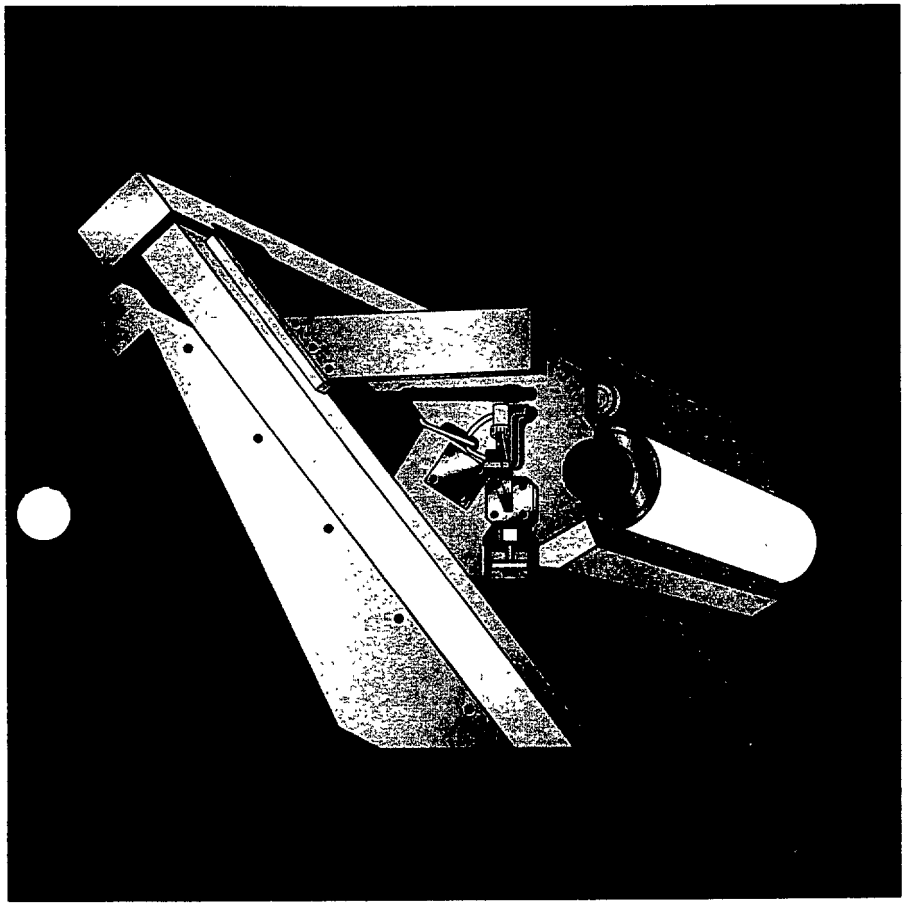


SUPER BLUE

PBC PLATE/BLANKET AND PC PLATE COATER

BECAUSE TO MOST CUSTOMERS HIGH GLOSS MEANS HIGH QUALITY

It is now possible to dramatically increase gloss levels of printed sheets



Winner

GRAPHIC ARTS TECHNICAL FOUNDATION GATF

InterTech Award

High-impact quality at low cost

Among print buyers and consumers alike, "gloss" and "feel" are strongly associated with quality. Through our systems, printers can profitably achieve superb finish-quality and high-impact appearance at low cost.

Our Plate/Blanket Coater (PBC) maximizes your coating flexibility, giving you more precise control and broader capabilities than ever before. Offering full-coverage gloss or matte coatings as well as spot coatings of impeccable register and quality, the PBC smoothly and consistently applies uniform coatings of a wide viscosity range to any desired thickness.

- Precision spot-register applications
- Elimination of halos and hard/beaded edges
- Maximum coating application

The advent of coatable, water-based and UV-curable resins offers sheetfed color printers the unprecedented power to add high gloss levels, special effects and unusual surface treatments to their range of ***in-house*** capabilities. These coatings vastly exceed the gloss potential of varnish, while banishing forever the mess and quality problems spray powder causes in the pressroom.

Maximize press utilization while minimizing clean-up

Because the PBC is easily retracted when coating is not necessary, the press unit used for coating can function as a full printing unit whenever you need it. Or, you can easily establish a dedicated coating line on an under used press. What's more, with our coaters, you will eliminate forever the press downtime associated with blanket cutting, packing and image registration. No other coater can accomplish this.

Our coaters minimize wash-up and makeready, offering unrivaled time and cost savings. Ruggedly constructed, easy to operate and maintain, our patented coaters are on the leading edge of industry technology

- Makeready as fast as regular ink presses
- Elimination of slinging and misting problems
- Minimized wash-up times

Improved quality means customer satisfaction

The PBC provides unparalleled quality control, enabling you to coat with as much control as you print. Coating material is applied as if it were another ink color, using your printing unit as it was designed to operate — to lay down a precise film membrane on the substrate.

What's more, the PBC achieves this high-impact appearance in a fraction of the time it takes to varnish or laminate — and without the mess and quality control problems associated with these now obsolete methods. So your customers receive the highest quality product, with an incredibly fast turnaround.

Super Blue Plate/Blanket Coater

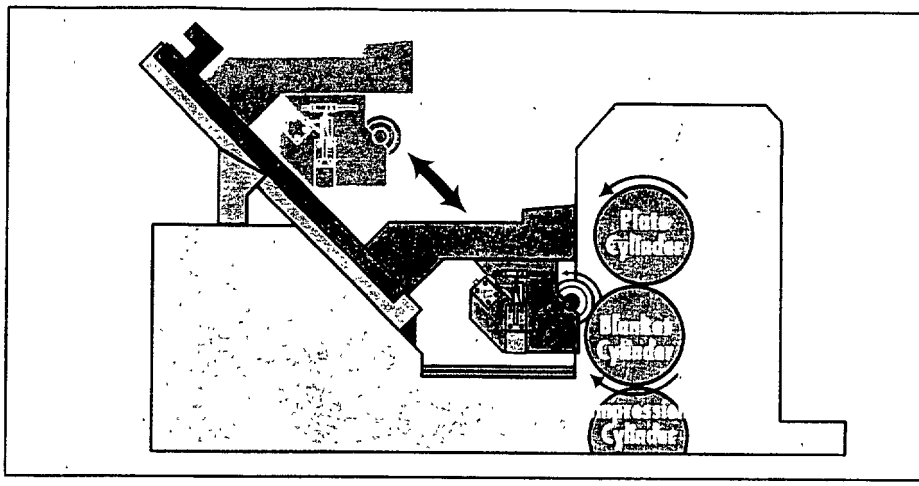
The PBC applies coating either at the blanket, for full coverage work, or at the plate, for precise register application of spot coating without hard edges. Or when coating is not necessary, it can be easily retracted to allow for regular printing uses. Unlike other coater designs that haphazardly squeeze coating material onto substrate under pressure — slinging coating material — the shear-coating PBC works neatly and precisely.

In the blanket mode when overall coverage is required, PBC's design provides for fast makeready and smooth application of the coating.

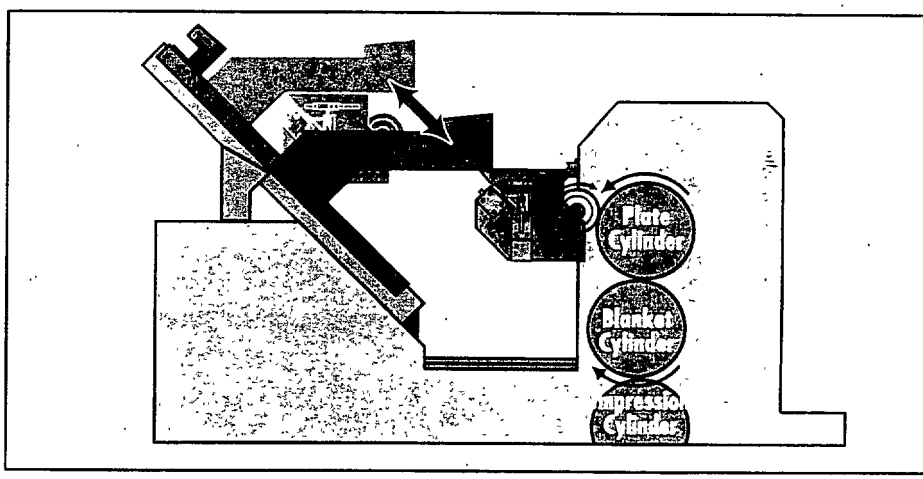
In the plate mode, the coater applies coating to a relief image on the plate cylinder to apply a uniform thickness of the coating film to the blanket cylinder. This coating "image" is then transferred by the blanket to the substrate, ensuring precise registration in all axes. Coating thickness and pressure between the plate, blanket and impression cylinders are all accurately and easily controlled.

Both the PBC and its Common Impression Cylinder (CIC) press counterpart, the Plate Coater (PC), improve operational profitability by eliminating the extensive "wash-up" downtime associated with coater dampeners — the only alternative with a CIC press. The typical two to three hour wash-up is reduced to less than a half hour, and the entire process is carried out independently from the press.

Being fully retractable, the coater does not interfere with the dampening system, ensuring fast changeover from print to coat and coat to print. This makes your entire operation more efficient ***and*** more profitable.



PBC in Blanket Position

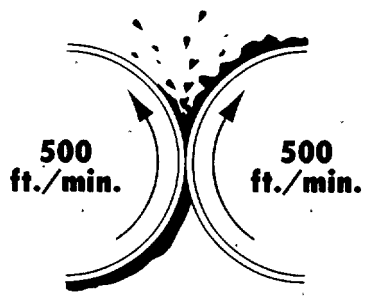


PBC in Plate Position

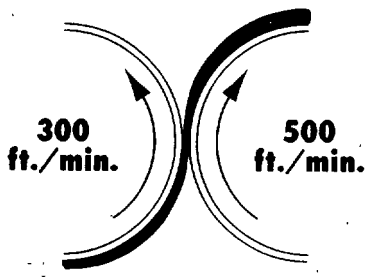
Productivity, safety and long-term value

As a supplier of precision-engineered coating and drying systems for the graphic arts and packaging industries, Printing Research, Inc.'s high-performance systems improve your bottom-line profitability by adding value to your existing operations. With our systems, you improve the quality of your services by becoming a low-cost provider of the highest quality printing — all while maximizing the utilization of your existing presses. Our dependable, high-performance systems will increase your sales, profits and customer satisfaction levels.

See the difference yourself. Experience a demonstration of our PBC and PC and witness how coatings can be as easy to handle and precise to apply as the ink used in daily printing!



NIP Application



SHEAR Application

Instant-drying inks and the elimination of spray powder have been the dream of every printer and printing buyer. The idea was put forward in the 1970's and 80's that it would be possible to print with conventional inks and apply a coating which would dry completely before placement on the delivery stack. This would place a dry skin over the ink, eliminating offsetting, sheet marking and the need for spray powder. The inks dry under the coating.

The advent of the 90's has made the dream a reality. It is now possible to print superior quality with conventional inks and coat the surface in order to deliver a dry, mark-free sheet at full production speeds. This is what the Super Blue products from Printing Research accomplish for you.

Printing Research, Inc.

10954 Shady Trail Dallas, Texas 75220 U.S.A.

Telephone 214-353-9000
Telex 794028 Superblue dal
Fax 214-357-5847

Patented

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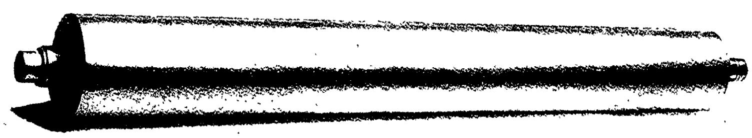
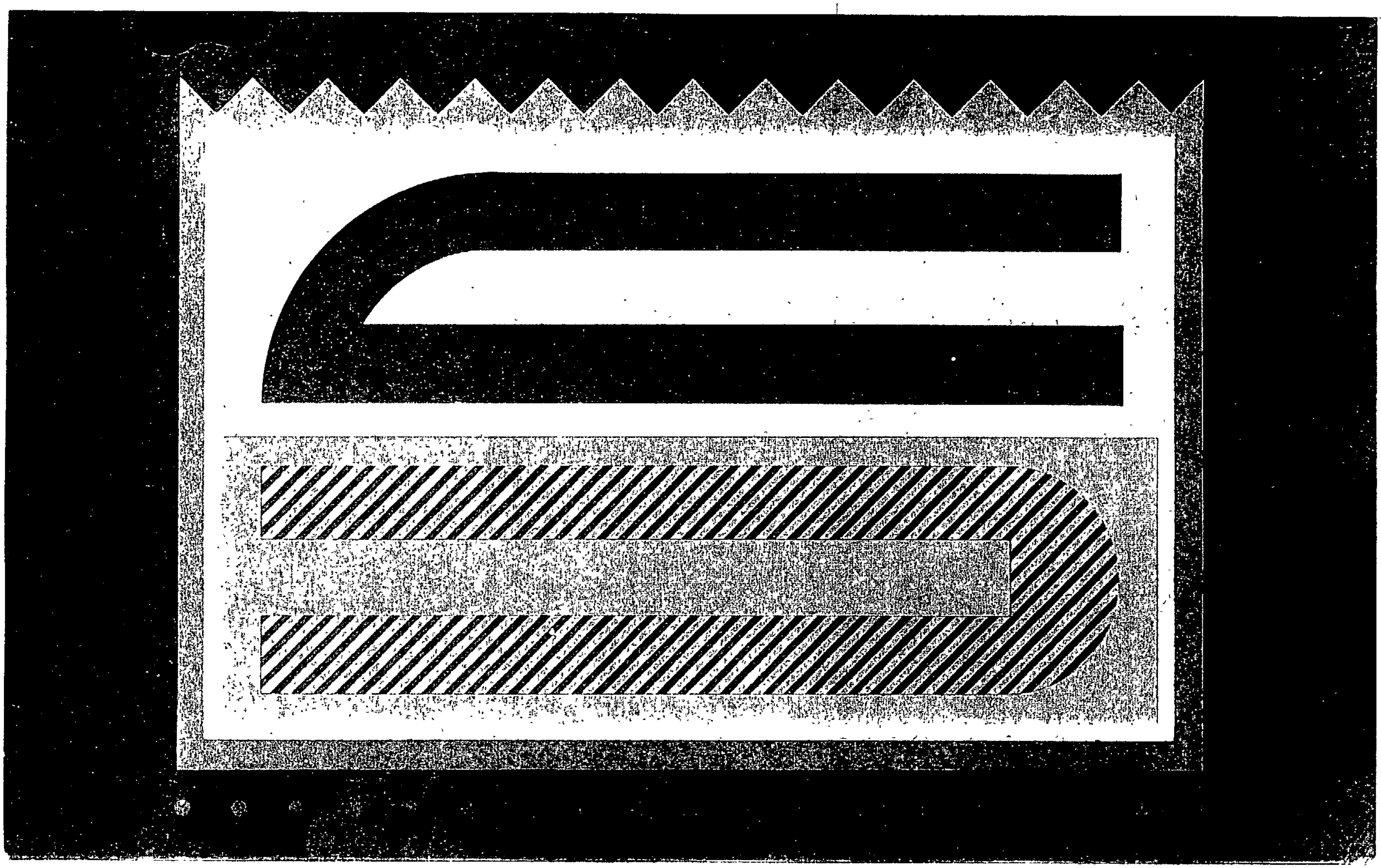
In coaters, one roll is three times better than three rolls.

Dahlgren proves once again that less is more.



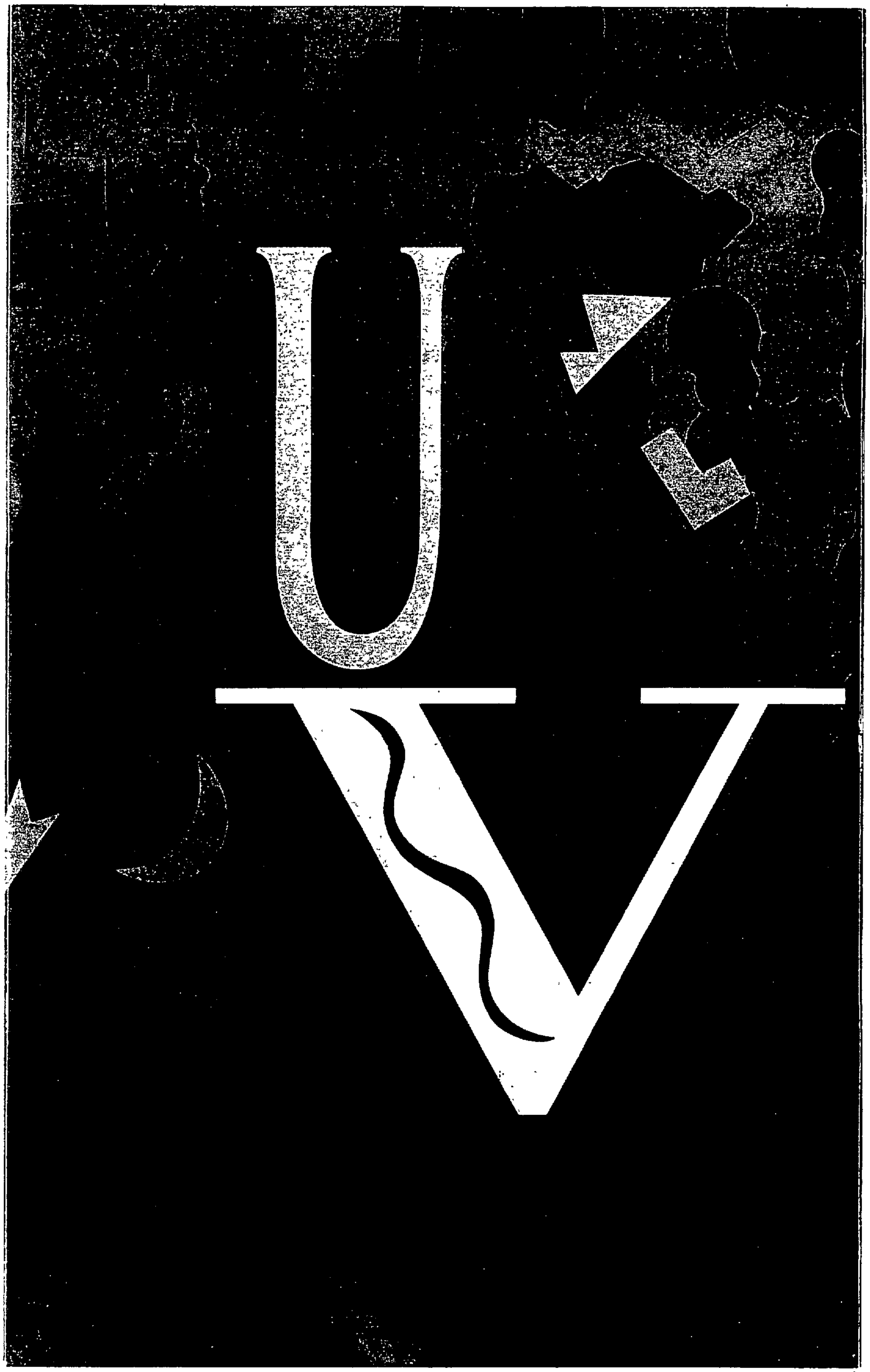


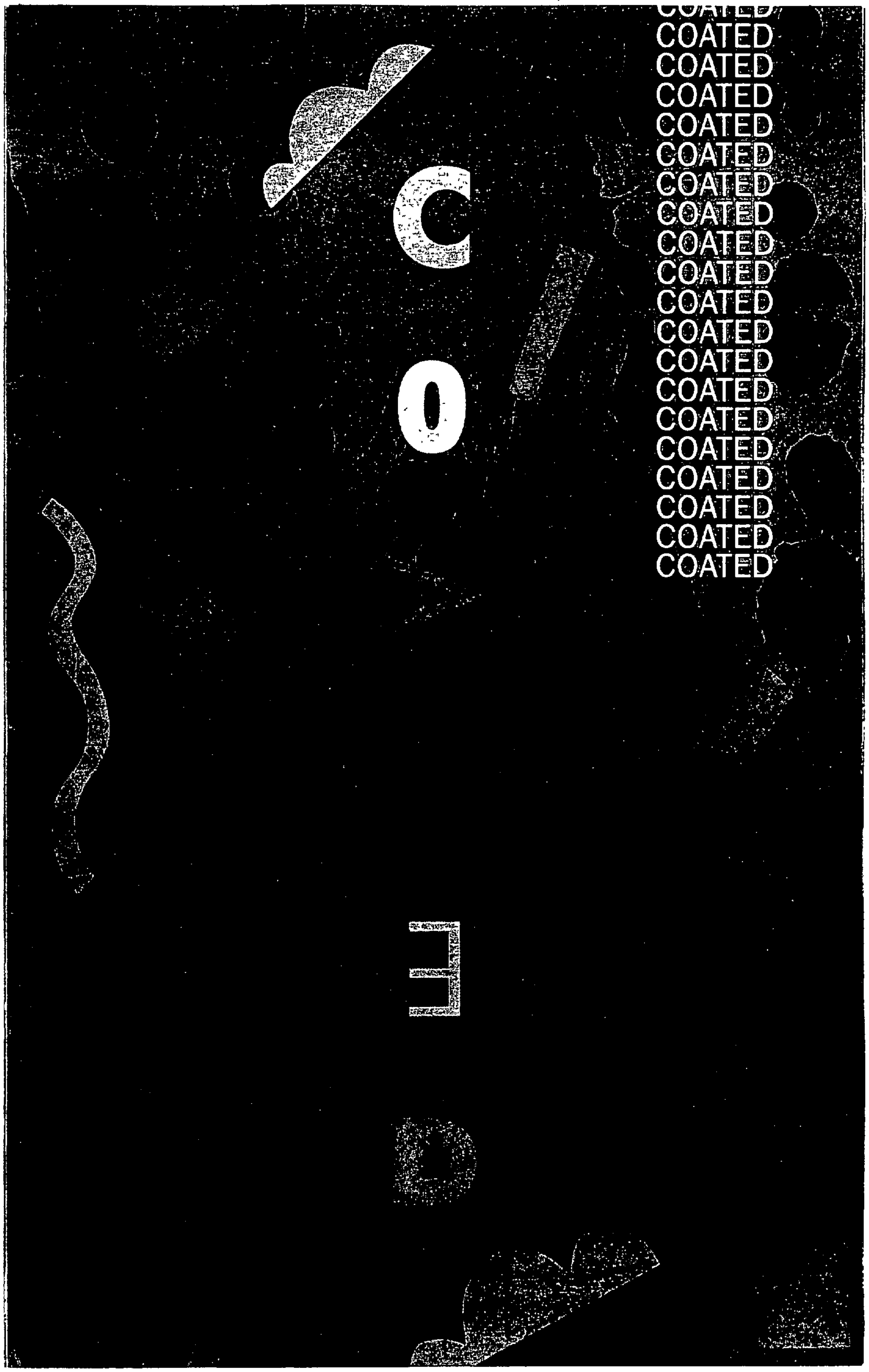
09315796 .051401

With Dahlgren's patented single–roll coater, achieving outstanding results is simpler than ever. Unlike multiple–roll coaters, the Dahlgren coater positively locks to the press to eliminate ridging, streaking, slinging and excessive orange peeling. It sets up in 5 minutes and cleans up in 10! And unlike other coaters, the Dahlgren system provides a uniform high quality coat, from start to finish. Coatweights can be adjusted at will.

Our single–roll coater provides relentless consistency for U.V., water based and specialty coatings on all popular sheet–fed presses up to 78" wide. And like all Dahlgren products, your Dahlgren coater is guaranteed to your specifications or your money back.

So call us toll–free at 1-800-527-5301 for more information today. And see how less is more with a Dahlgren.

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Ask about our new coater for Heidelberg Speedmasters.™ It lets you simultaneously coat and print on a single printing station!

P.O. Box 115140, Carrollton, TX 75011
(214) 245-0035

One roll outshines them all.

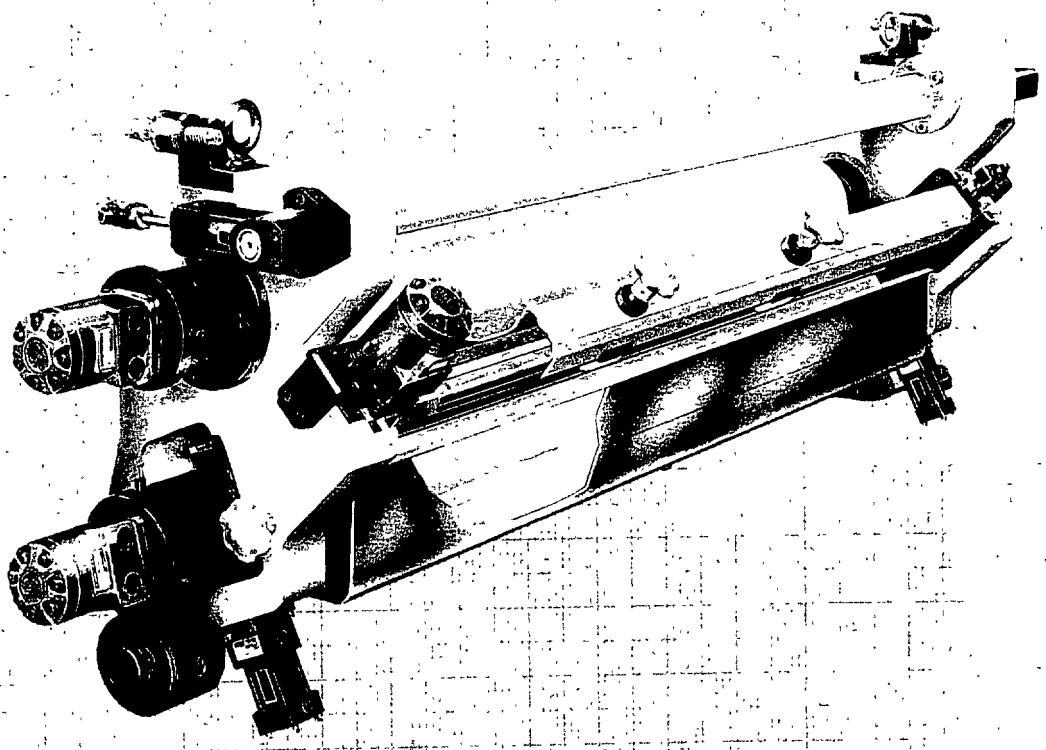
DAHLGREN®

58

BLANKET COATER

For application of aqueous or coatings direct to the blanket cylinder.

IVI COLORDRY INC
TECHNOLOGY FOR PRINTING



Ruggedly constructed, simple to install and operate, the IVT COLORDRY Coater saves time and money, and assures smooth, uniform application of coatings of wide viscosity range and various thicknesses. The three-roll system, an in-line retrofit bolted to the last printing unit, permits application of coatings to printed sheets in line. When coating is not required, the IVT COLORDRY Coater is easily retracted on its pillow-block type mounts, and the printing resumes its normal printing mode.

The IVT COLORDRY Blanket Coater.

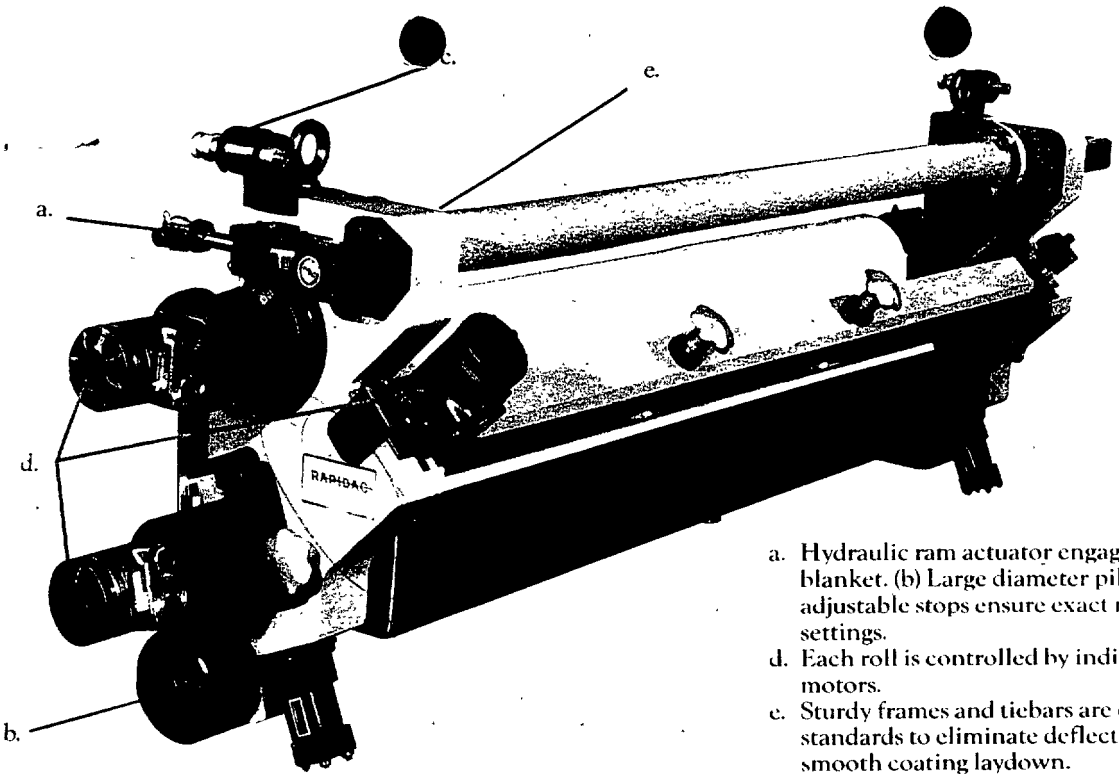
Applies water-based, ultra-violet or other suitable coating materials directly to the blanket cylinder of a sheet-fed offset press.

The IVT COLORDRY Blanket Coater can be used for either overall or spot coatings, and with a suitable drying system will eliminate the need for spray powder or press varnish. Press clean-up time is reduced, since only the blanket cylinder is used in the coating operation.
Coating thicknesses are easily varied, from a thin protective film to a thick laminate finish, by adjusting the speed and pressure of the individually-controlled, hydraulically-driven rolls.

Save time, increase productivity and lower costs.

- Fits almost all presses. *The IVT COLORDRY Blanket Coater can be installed on a variety of sheet-fed presses. If desired it can be installed on a coating station, rather than attached to a printing unit.*
- Fast installation. *Simple, bolt-on retrofit; installation time normally two days of press down-time.*
- Individual R.P.M. Indicators. *For easy set-up and control.*
- No interference with press run. *Coater can be quickly and easily retracted or removed from press when not in use.*
- Direct to blanket cylinder. *Coating is applied from the applicator roll directly onto the press blanket cylinder.*
- Variable thicknesses. *Coathing thickness can be adjusted during a run by varying coater roll speeds.*
- Even laydown. *Application direct to the blanket eliminates one split, provides greater control.*
- No roll changes. *Metering of coating is simple and effective over a wide range of applied thicknesses. No need for roll changes.*
- Compact. *The IVT COLORDRY Blanket Coater is designed to occupy the least possible space on the press.*
- Rugged. *Sturdily constructed to give dependable, lasting service.*
- Reduced clean-up time. *After coating, only the blanket cylinder requires cleaning. The ink train, dampening system and plate cylinder remain clean and ready for use.*

Control panel operates both the coater and the hydraulic power unit. Digital meters continuously show RPM readings for each of the three rolls.

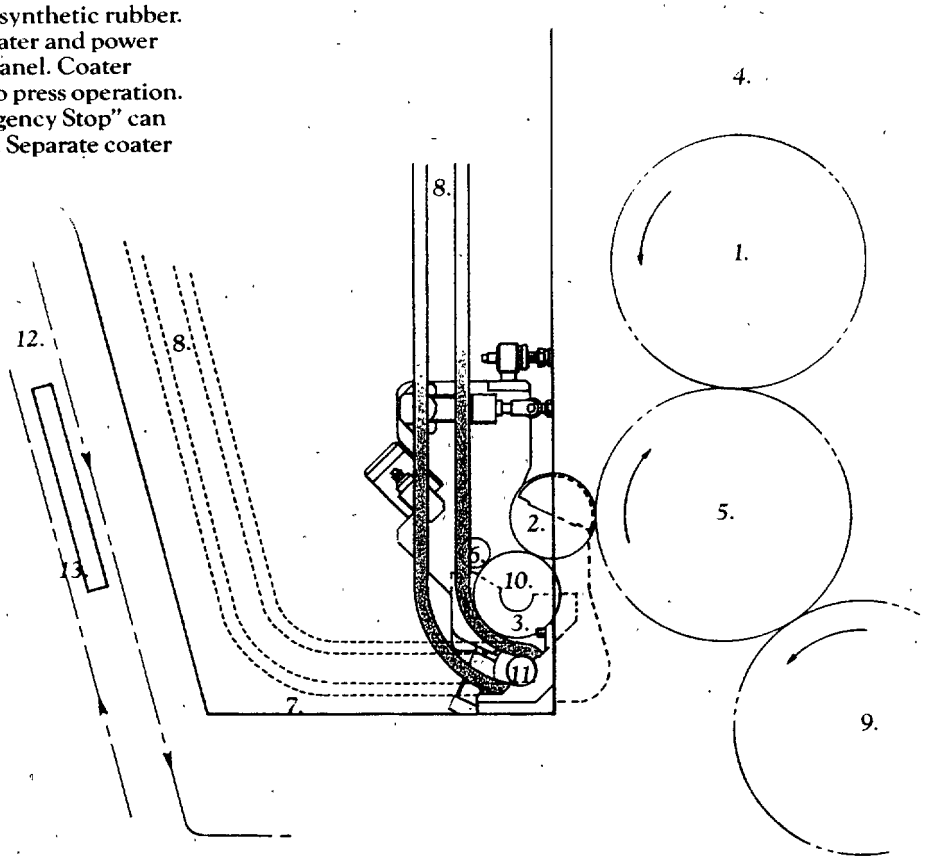


a. Hydraulic ram actuator engages coater with blanket. (b) Large diameter pillow blocks and (c) adjustable stops ensure exact repeatability of settings.
d. Each roll is controlled by individual hydraulic motors.
e. Sturdy frames and tiebars are engineered to press standards to eliminate deflection and ensure smooth coating laydown.

Specifications

- Three roll design — Metering roll is chrome. Applicator and pick up rolls are synthetic rubber.
- Single Control Panel — Both coater and power unit are controlled from single panel. Coater operation is electrically linked to press operation.
- Emergency Stop — Press "Emergency Stop" can be interlocked to include coater. Separate coater "Stop" control is provided.

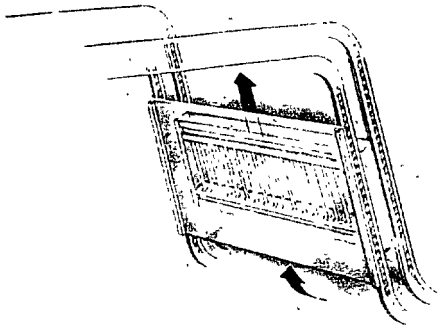
The Blanket Coater is retractable, and does not interfere with the dampening system, with fast changeover from print to coat and coat to print. The applicator metering and pick up rolls are independently driven through a hydraulic system, with the applicator being able to be run in reverse. Slinging, misting, striations, gear markings, and consequent loss of gloss, are largely eliminated. Greater flexibility in coating weights and optimum lay flat properties are achieved.



1. *Plate Cylinder*
2. *Applicator roll*
3. *Coating pan*
4. *Last press unit*
5. *Blanket cylinder*
6. *Metering roll*
7. *Rear deck*
   Retraction systems
   Impression cylinder
10. *Pic-up roll*
11. *Pillow block mounts*
12. *Press delivery*
13. *Dryer to suit aqueous or UV coatings*

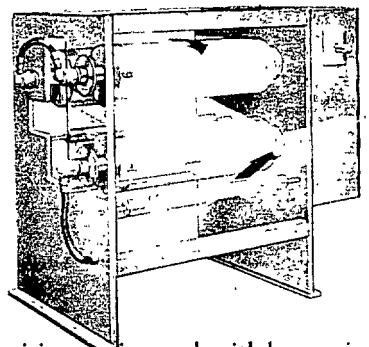
Other IVT COLORDRY products:

WATER COOLED IR DRYING SYSTEMS



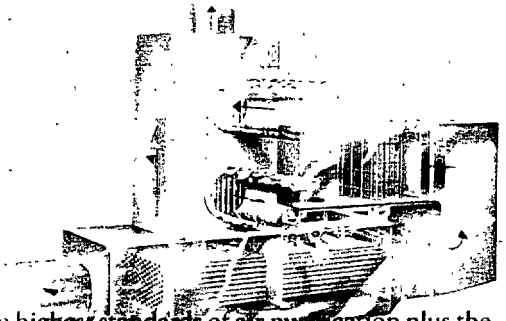
For accelerating ink drying reducing spray and or drying of aqueous coatings.

CHILL ROLL STAND



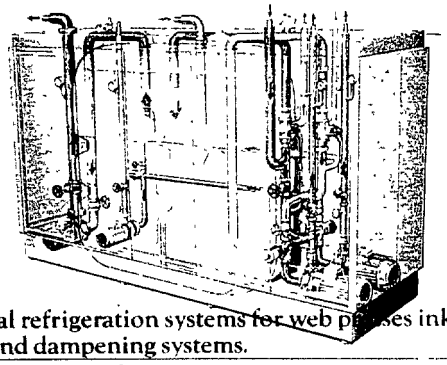
Compact, precision engineered, with low maintenance.

CATALYTIC PURIFIER



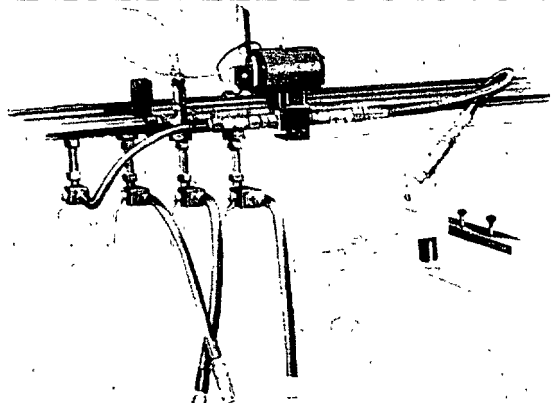
The highest standards of air purification plus the economy of heat reclamation.

PROCESS COOLING EQUIPMENT



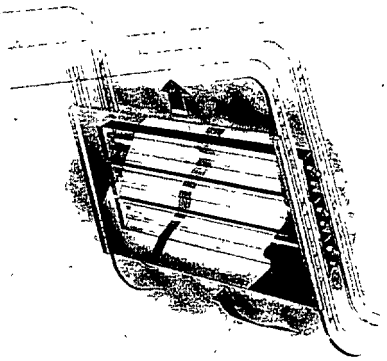
Central refrigeration systems for web presses inking, chill and dampening systems.

INK LEVELLING SYSTEM



Long term reliability plus metering of ink consumption.

'COLD' UV SYSTEMS



For the curing of UV inks and coatings on any substrate.

IVT COLORDRY INC
TECHNOLOGY FOR PRINTING

IVT COLORDRY INC. · 425 Post Road · Fairfield, Connecticut 06430 U.S.A. · Telephone: (203) 255-9201 · Telex: 643433

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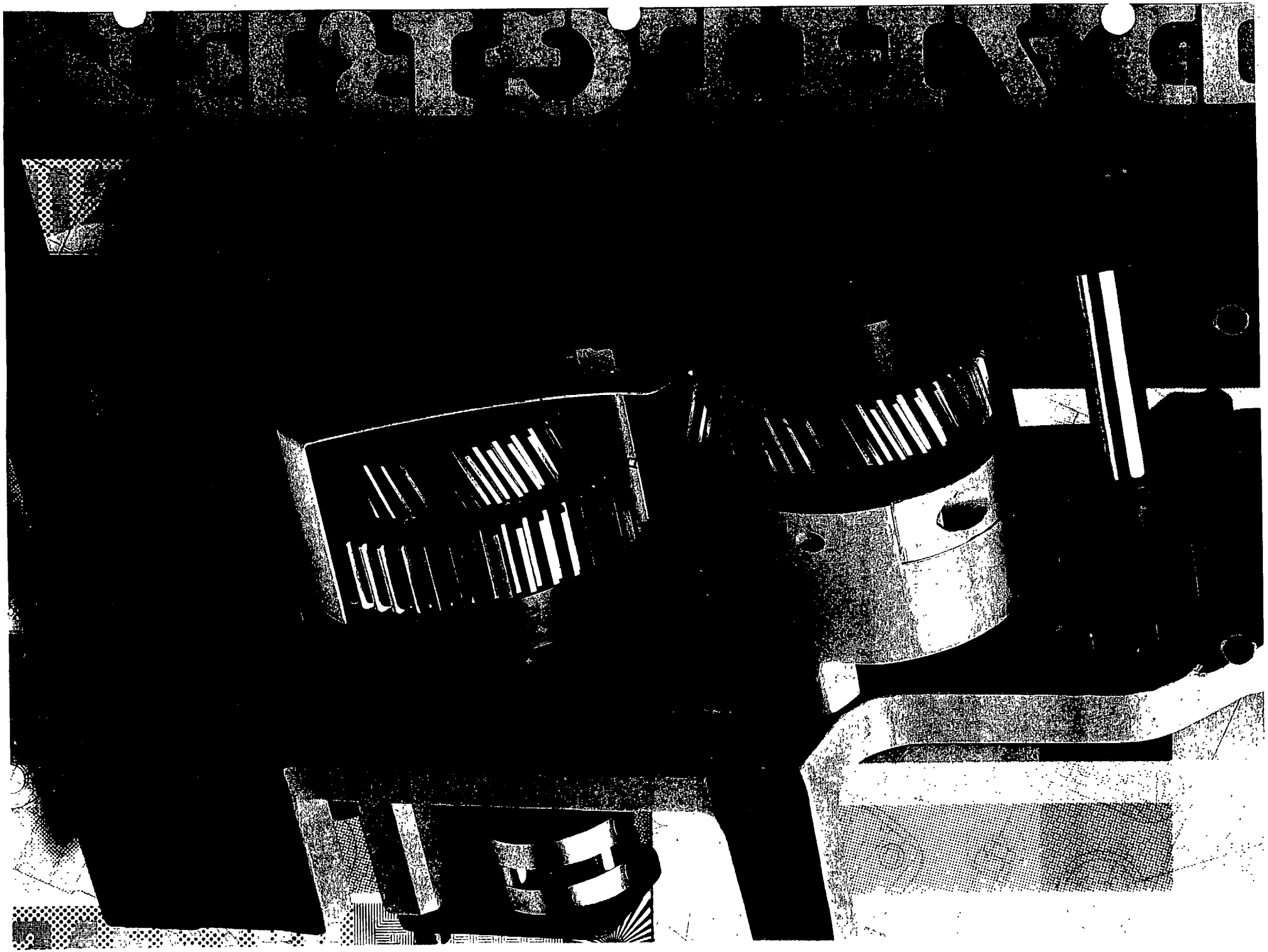


Johann Gutenberg invented the first mechanical printing press in 1439. More than 550 years later, Dahlgren is still finding ways to improve on the concept.

In 1485, Ratdolt pioneered the use of color printing using a basic stencil technique. Using Dahlgren dampeners, today's printers achieve stronger colors than ever before.

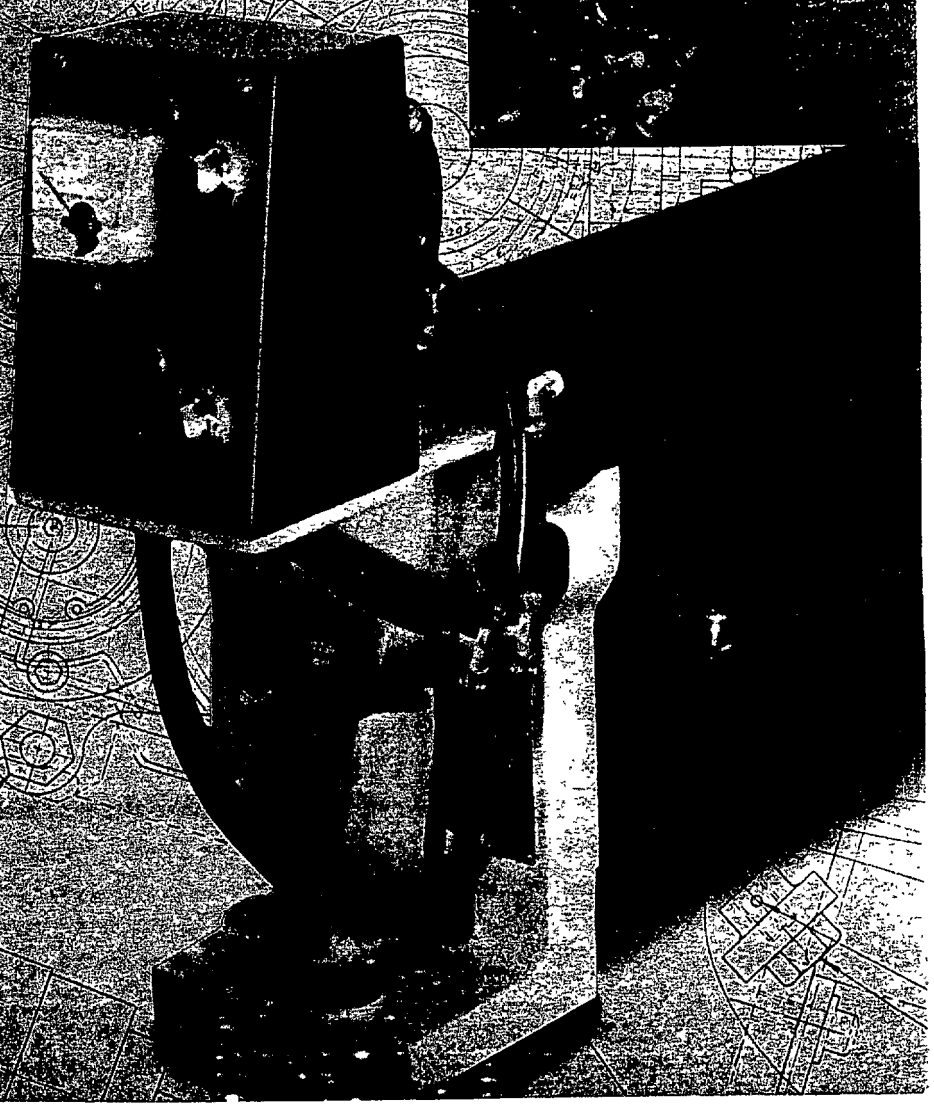
No doubt, the printing industry would still be alive had Harold Dahlgren never arrived on the scene. Yet, he did. And because of his creativity and leadership, the printing industry will never be the same.

THE ROLLS OF THE PRINTING INDUSTRY

Harold Dahlgren invented the first continuous-duty dampening system for offset presses, launching a new age of productivity and efficiency for printers everywhere. He was the first to put a coater on a press. He developed the skewed roller system, permanently hydrophilic rollers and many other innovations that have redefined the litho graphic process.

To this day, Dahlgren has more dampeners and coaters in operation than any other company worldwide. And the ideas are still rolling. Because today, as it has since 1959, The Dahlgren Company is run by thinkers – men and women whose commitment to the industry is to lead through innovation – professionals who dare to explore new directions, which result in solutions you can use to better run your printing operations.

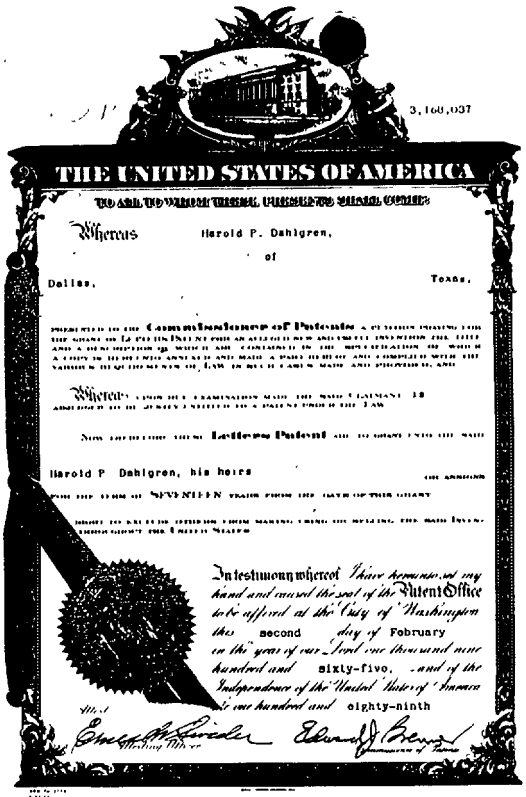
Whatever measure of quality you apply when you speak of coating and dampening for the printing industry, Dahlgren leads the way.



1500

Pope Alexander VI instituted the first censorship of printed books in 1501. Today's free press enjoys unparalleled options in a variety of products offered by The Dahlgren Company

Da Carpi develops and patents the art of chiaroscuros multi-color woodcuts in 1516 Today, the Dahlgren name appears on more than 180 patents issued for coaters and dampeners worldwide



3,160,037

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Whereas Harold P. Dahlgren,

of

Dallas, Texas,

Whereas

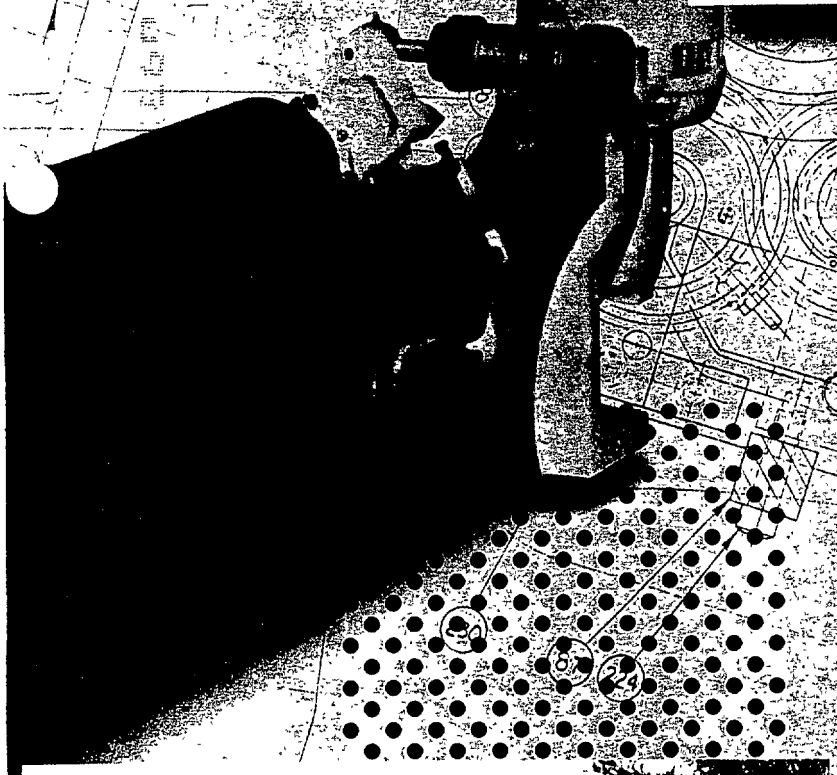
Harold P Dahlgren, his heirs

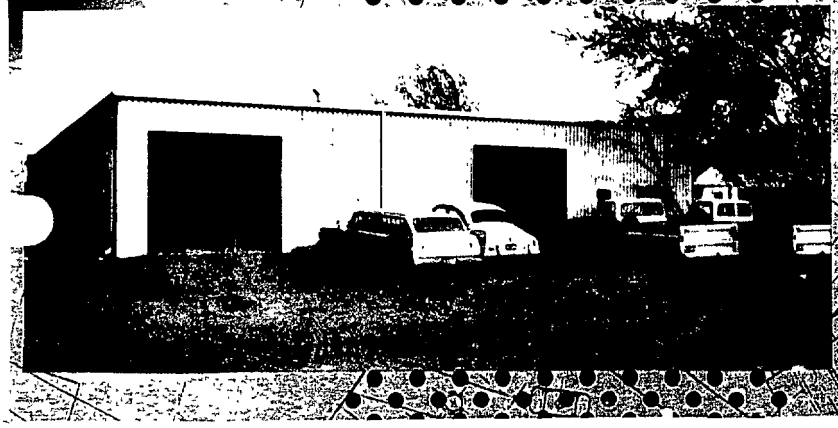
SEVENTEEN

In testimony whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington this second day of February in the year of our Lord one thousand nine hundred and sixty-five, and of the Independence of the United States of America the one hundred and eighty-ninth

"Fighting the conventional dampening system for seven hours can make you hostile. I know. I used to be a pressman. But I was fighting more than I was printing, and I wasn't efficient. That's what gave me the itch to come up with a better dampening system."

Hal Dahlgren





In more than 180 cases, Dahlgren has broken through conventional thinking to develop unique and novel printing concepts recognized by patent offices worldwide. This track record of innovation carries on today, as talented personnel interpret customer input into the technological breakthroughs that will drive the printing industry for years to come.

1600

A new, right, graceful style of illustration emerges from Callot's copperplate tests in 1630. Over the years advances such as hydrophilic rollers have resulted from Dahlgren testing.

1700

Alcy secures first English patent on colored printing inks in 1772. Precise metering of the ink/water balance is what makes Dahlgren Dampeners the choice for successful printers now.

Aloe's Senefelder discovered lithography in 1798 based on the principle that ink and water don't mix. Years later, Dahlgren vastly improves this technology with the first continuous-duty dampening system.

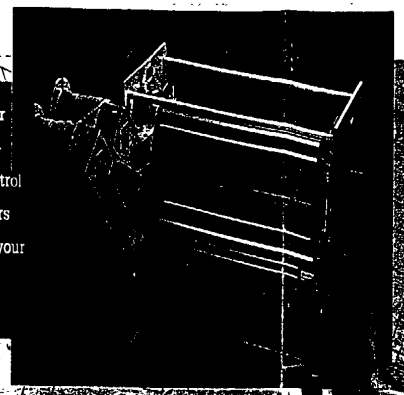
DAHLGREN DAMPENERS MAKE EVERY SHEET COUNT

Designed for sheetfed and web presses, the Dahlgren Dampener represents the single most productive equipment investment possible for your pressroom. For less than 10% of the replacement cost of a new press, you can improve print quality, reduce downtime, have less waste and improve profitability — all while enhancing the resale value of your existing equipment.

The Dahlgren Dampener provides continuous-duty operation, responds instantly to one control, instantly — not 50 to 100 sheets later. Halftones print sharper, drying time is reduced. And your press prints cleaner than ever before.

With nearly 2,000 proven designs on file at the Dahlgren plant, we can provide a dampening system that suits your specific needs. From innovative design to quality manufacturing and ease-of-use, Dahlgren Dampeners are made to enhance your printing performance.

The Dahlgren High Speed Web Dampener provides the ultimate in enhanced productivity and performance. Precise water control eliminates emulsification for stronger colors and improved print quality. It won't limit your press speed, and it's simple to adjust and operate, as well as easy to maintain.



The Dahlgren 4-Roll Dampener with Differential Drive offers all the advantages of our 3-Roll design, plus it maximizes ink capacity for stronger colors and smoother solids. These precise metering and 'hickey' removal features ensure clean print quality for less waste with fewer rejects. Plus, its unique combination of nips will reduce or eliminate the amount of alcohol used, while its oscillating bridge roller and additional form roller dramatically reduce ghosting.

The Dahlgren 3-Roll Dampener represents the industry's first continuous-duty dampener. It's the least expensive of our line, yet it adjusts with all the ease and performs with all the durability, simplicity and quality you can expect whenever you run with a Dahlgren.

1800

The "fly" and other principles for automatic press are invented by I. Adams of Rochester in 1834. In 1959, Harold Dahlgren established the principles that still drive Dahlgren today.

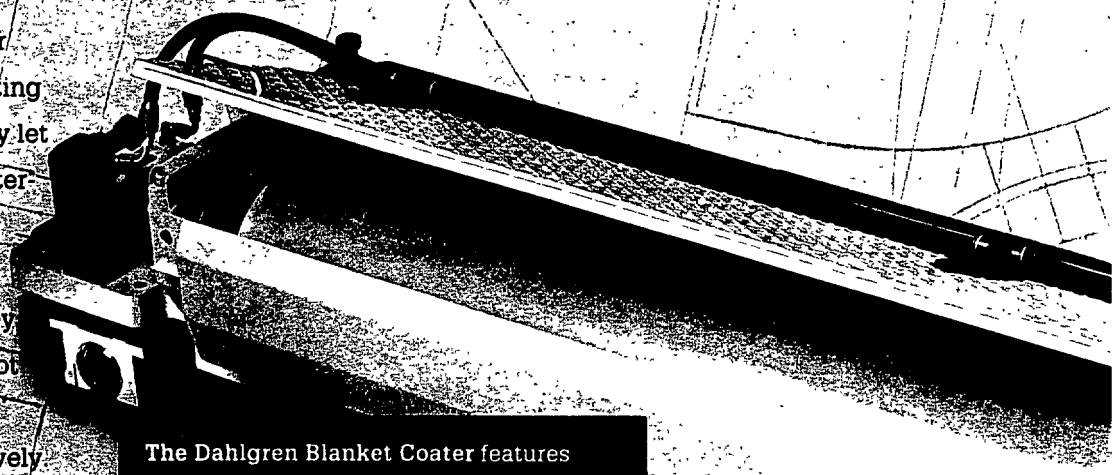
Robert Barclay in 1875 conceives the lithographic process known as offset printing. Dahlgren supplies a full scope of coaters and dampeners for today's most popular web and sheetfed offset presses.

Three-color process printing with half-tone cuts is invented by Kurtz and Ives in 1892. Dahlgren-equipped presses make the entire printing process more profitable and professional.

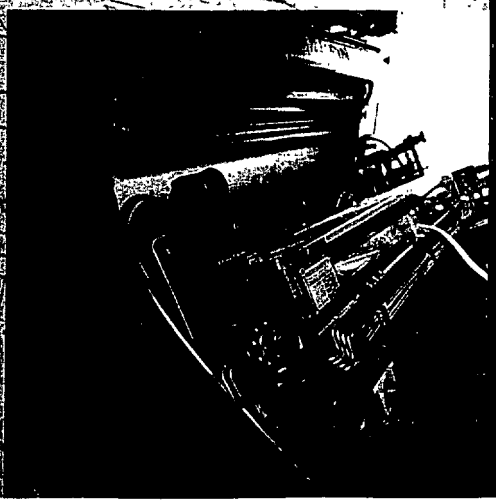
DAHLGREN COATERS ADD PROFITS TO YOUR PRESS

Getting the most out of your press is what Dahlgren coating systems are all about. They let you charge for the U.V., water-based and specialty coating jobs you or your customers might send elsewhere. They are the finest for overall, spot pattern coating, plus, they install easily and inexpensively.

Engineered to start up and clean up in minutes, Dahlgren coating systems are easy to use and maintain. They're compact, built to last and available in a wide variety of configurations for both web and sheet-fed presses. What's more, they incorporate a patented drying system, which helps you reduce the mess and expense of spray powder, while you cut turn-around time and lower production overhead. If you want to improve your competitive edge and offer your customers the high gloss and protective benefits only coating can provide, specify Dahlgren.



The Dahlgren Blanket Coater features single roll simplicity for on-the-run adjustment and uniform coverage overall. It's the easiest coater on the market to maintain and operate. It sets up in 5 minutes, cleans up in 10. And like all Dahlgren products, it can be customized for your unique application, while giving you the highest amount of coating laydown of any blanket coater. What's more, this patented coater eliminates ridging, slinging and greatly minimizes orange peeling.



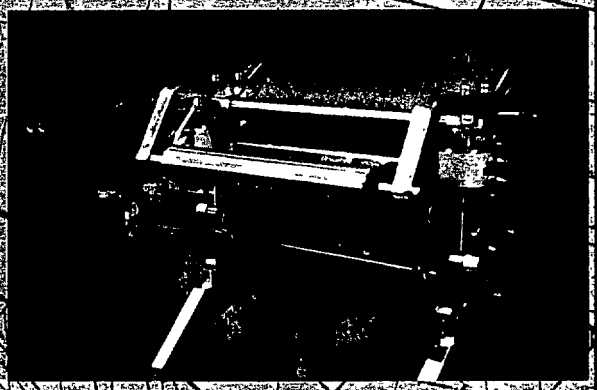
The Dahlgren LithoPlus™ Coater is designed for some of the most popular presses. It allows you to print and coat in a single pass, without sacrificing a printing unit. Plus, because it can be retracted out of the way, regular print jobs can be run easily. With the revolutionary, patented LithoPlus Coater, you save time, money and space, while improving quality and profits. Available with blanket and plate clamping systems and optional pin registration.

1900

In 1910, The Freiburger Zeitung is the first newspaper to use rotary photogravure press. Dahlgren's list of "firsts" includes skewed rollers, continuous duty dampeners and in-line coating.

In 1956, Harold Dahlgren invented the brush dampener for web offset printing. His ideas have since revolutionized the efficiency and productivity of printers everywhere.

Throughout the 1990s, Dahlgren will continue to carry out its tradition of quality, service and competitive excellence. For the greatest performance in printing, turn to Dahlgren



The Dahlgren Web Coater allows you to apply U.V., catalytic or aqueous coatings to the web. It's versatile and compact. It easily fits inline. And its simple operation enhances productivity, while delivering the coating quality your customers demand.

The Dahlgren Coater/Dampener, the industry's first inline coater (1972), converts from a dampener to a coater in a matter of minutes. Also available with differential drive, our coater/dampeners offer the visual appeal of coated sheets, with the efficiency and clarity only Dahlgren can provide.

No one offers a broader line of coaters and dampeners than Dahlgren. So it's no secret, we also offer the accessories you need to achieve even greater results. Our people are constantly working to improve the performance of today's printing technology. And with each revolution, we reinforce our leadership position.

The Dahlgren Ghost Chaser provides a smoother, more uniform ink laydown for less ghosting and streaking, with improved color and reduced waste.

Dahlgren UV/IR Water-Cooled Drying Systems protect your press from heat, while curing or drying ink and coatings on virtually any substrate.

DAHLGREN IMPROVES YOUR IMAGE

As a custom engineering firm, Dahlgren combines the finest craftsmanship with the latest technology — computer-aided design, numeric and computer-numeric controlled manufacturing systems — to provide responsive, one-of-a-kind manufacturing capabilities for your specialized needs. We stock thousands of parts, maintain on-line inventory systems and provide prompt shipping schedules to ensure your ultimate satisfaction. In effect, we are your full-service resource for everything from engineering to manufacturing to installation and training. At Dahlgren, you get it all.

Dahlgren Coater and Dampening Circulation Systems are designed to save space, and provide optimum and efficient control of fountain solutions and/or coatings to keep your presses running at their absolute peak efficiency.

Put Dahlgren Ingenuity To Work For You. With more than 180 patents issued to our credit, and more than 70,000 proven coating and dampening systems in operation worldwide, Dahlgren is without question the leader in the industry.

Based in Carrollton, Texas, Dahlgren USA represents the full manufacturing, engineering, service, sales and installation team you need to improve your printing performance. Our people can work directly with you to custom-engineer any system that answers your needs exactly. And our factory-trained service technicians provide the installation and training necessary to get your system up and running fast. We guarantee your satisfaction. We welcome your suggestions. And we invite you to discover the quality, efficiency and performance that has made Dahlgren the most respected name in printing today.

P.O. Box 115140
Carrollton, TX 75011

(214)245-0035
1-800-527-5301
Fax (214) 245-0768

Coating Guide

Front & Back Covers *have been both Aqueous and U.V. coated.*

Pages 2 - 3 *no coating*

Pages 4 - 5 *Aqueous coating only*

Pages 6 - 7 *U.V. coating only*

This brochure was aqueous and U.V. coated on a Heidelberg Speedmaster using a Dahlgren LithoPlus™ Coating System.

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Increase Profit and Expand Your Market with Dahlgren's Retrofit Coaters

Ask Ariel Schmidt, president of Clinton, MA-based Atlantic Graphic Services (AGS) what he thinks about the patented new LithoPlus coater from Dahlgren, and he'll tell you: "The LithoPlus has given us an edge. By allowing us to print and coat inline, it has enabled us to deliver a better-looking and better-feeling product in the same amount of time we normally used to print."

As the only coater in production that allows you to add coating to your press, without losing that unit's ability to print and coat at the same time, the LithoPlus is making a believer out of many printers.

AGS is just one example. Facing tough economic times, the New England printer needed to find new ways of maintaining a profitable business. Two seemingly counter-solutions emerged: lower overhead; and expand services. At first, it seemed an impossible task. But as the company explored its options, the LithoPlus coater proved worthy. By allowing AGS to print and coat inline, the company was able to save time and cost, and avoid loss of control when farming-out coating jobs.

Says Ariel: "Despite the economy, we're able to run two shifts on our Mitsubishi six-color press. We can deliver the jobs one or two days sooner, and the cost to coat is less than a penny per press sheet. At that rate, we're more than able to cover our capital investment and make a profit, while giving our customer a higher-quality product."

AGS coats virtually 100 percent of the output from its Mitsubishi press. AGS has now installed a second LithoPlus on its two-color Heidelberg Speedmaster. Sales are up 18 percent, and profits have risen 22 percent.

Says Schmidt: "The feel of the printed sheet and the gloss make a positive impression on customers. Because of coating, our rejection rate has dropped to almost zero. We've also saved on freight and the hassle of dealing with outside specialty suppliers."

Currently available for the Heidelberg Speedmaster and Mitsubishi sheetfed presses, the LithoPlus is equipped with plate clamps for precision spot coating. Each installation is engineered to customer specifications.

Dahlgren also offers the industry's top-selling blanket coater. This single anilox roll coater features the same coating head as the LithoPlus system. No other coater can lay down more coating with more uniformity. Set-up takes only five minutes, clean-up only ten. Slinging, streaking and orange-peeling are eliminated. And with more than 200 installations worldwide, the Dahlgren blanket coater is a proven performer.

Web coaters for overall coating in one- or two-sided jobs are also available from Dahlgren. These allow aqueous or UV coating to be applied inline on webs up to 66 inches, at speeds up to 2,000 fpm.

Meanwhile, sheetfed presses can still benefit from Dahlgren's traditional coater/dampener technology. Dahlgren's new differential drive coater/dampener combines the advantages of the new differential drive dampener — eliminating hickeys, ghosting and alcohol — with Dahlgren's coating system.

Dahlgren engineers have also converted one- and two-color presses into productive off-line coating systems, working with such models as Harris, OMSCA, Miller and Miehle/Roland. Its technical staff can help with virtually any unique coating system, from two-roll coaters to plate coaters. And as with all Dahlgren equipment, each product is covered by Dahlgren's guarantee that if the unit doesn't perform to customer satisfaction, Dahlgren will remove it and provide a full refund.

So if you'd like to improve the overall quality and profitability of your printing business, consider the words of Ariel Schmidt: "When it comes to service, Dahlgren is it."

For more information, call 800-527-5301, write Dahlgren USA, 1725 Sandy Lake Rd., Carrollton, TX 75006

David Linton adjusts AGS' Dahlgren LithoPlus coater.

REPRINTED WITH PERMISSION FROM HIGH VOLUME PRINTING SEPTEMBER/OCTOBER 1995

DAHLGREN'S COATER CHALLENGE: $1,000,000.00

Dahlgren invites other coater manufacturers to put up or shut up.

At Dahlgren, we're so sure our patented Blanket Coater is the best in-line sheet-fed blanket coater on the market today, we'll pay any manufacturer $1,000,000 if they can prove their coater lays down more coating, more uniformly, at production speeds, with less trouble than ours. Just run the same blankets, coating, and stock under the same conditions, and if Dahlgren doesn't come out on top, we'll pay $1,000,000 on the spot. It can't be done.

What does that mean if you're in the market for a new press or retrofit coater? It means that if any coater or press manufacturer tells you their coater is better than the Dahlgren Blanket Coater, they're not telling you the truth. Here's why:

"The Dahlgren Blanket Coater combines advanced, patented, proprietary technology with more than 20 years of coating experience to bring you the best coater money can buy. Period."

We've seen it happen too many times. Printers are sold a bill of goods by a manufacturer who claims their coating unit or tower will perform "just fine" and that an "extended delivery" is a necessity. Months later, when the cost in lower production speeds, wasted stock, rejects, and lost time mounts, these same printers retrofit with a Dahlgren Blanket Coater. Suddenly, they get results. Why?

Dahlgren was the first company to put a coater in line on a press. Since then, we've perfected the process using a simple, easy-to-use design that features an anilox roll and doctor blade configuration for maximum coverage and uniformity. This single-roll design makes the Dahlgren Blanket Coater simpler and more reliable than other, more complex designs. No other coater even comes close.

"Dahlgren's unique, rugged, single-roll design eliminates the problems of orange-peel, slinging, and ridging common to multiple roller coaters."

The magic behind the Dahlgren Blanket Coater is simple. Our single, anilox roll coating head uniformly carries more coating to the blanket and sheet than any combination of rubber or chrome surfaces can possibly carry. That's because each anilox roll cell "cups" the coating, carrying more and losing less.

Once the coating is applied to the roll, a special doctor blade uniformly removes excess coating from the roll surface and returns it to the nip for replenishing. The coating is then applied to the blanket from the roll. Competitive coaters return any excess coating to a roller train, causing non-uniformity, ridging, slinging, and fading from gripper to tail.

Our coater is hydraulically locked to the press, to ensure rigidity and eliminate the chattering effect you may find on other coaters. What's more, you can run at full production speeds for maximum productivity. One million dollars says you can't do better than that.

"Quality always pays. Which is why the Dahlgren Blanket Coater is the best investment you can make in a coating unit. And you can take that to the bank."

Whether you're running U.V., water-base, blister seal, or specialty coatings, you won't find a better way to apply it in-line than with a Dahlgren Blanket Coater. No matter what our competitors would like you to believe, remember Dahlgren

- Lowers your cost,
- Improves your production,
- Can eliminate spray powder
- Increases your customer satisfaction,
- And offers a money-back guarantee.

If you're a manufacturer with a tall tale to tell, put up or shut up. Take the Dahlgren $1,000,000.00 challenge. If you're in the market for a coater, don't take a chance. Buy a Dahlgren. One roll outshines them all.

P.O. Box 115140 Carrollton,TX 75011
(214)245-0035 Fax (214) 245-0768

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United States Patent [19]

Abendroth et al.

[11] **4,446,814**

[45] **May 8, 1984**

[54] **DEVICE FOR APPLYING A FLUID, IN PARTICULAR LACQUERS ON PRINTED SHEETS OR CONTINUOUS WEBS**

[75] Inventors: **Paul Abendroth; Janko Despot**, both of Offenbach am Main, Fed. Rep. of Germany

[73] Assignee: **M.A.N. - Roland**, Fed. Rep. of Germany

[21] Appl. No.: **347,144**

[22] Filed: **Feb. 9, 1982**

[30] **Foreign Application Priority Data**

Feb. 12, 1981 [DE] Fed. Rep. of Germany 3105020

[51] **Int. Cl.**³ **B05C 1/00**

[52] **U.S. Cl.** **118/694**; 118/46; 118/262

[58] **Field of Search** 118/694, 259, 665, 262, 118/46, 210; 101/363

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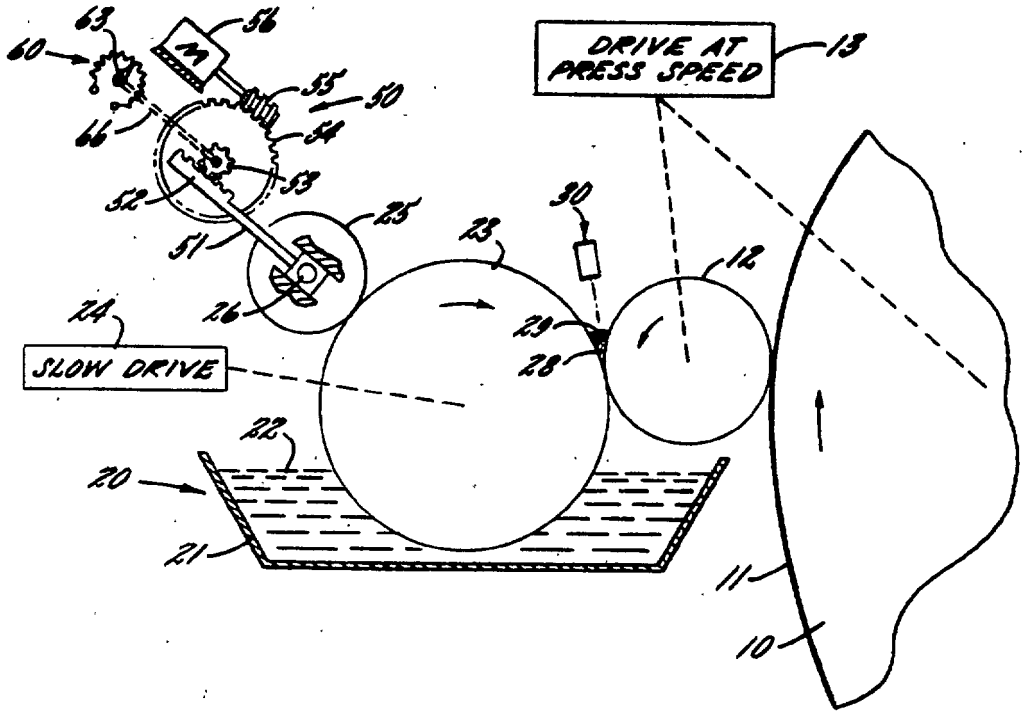
Primary Examiner—John P. McIntosh
Attorney, Agent, or Firm—Leydig, Voit, Osann, Mayer & Holt, Ltd.

[57] **ABSTRACT**

A device for application of lacquer or the like to a sheet in a printing press. The lacquer is applied by an applicator cylinder having an associated applicator roller. Lacquer is fed from a fountain having a fountain roller which is slowly driven, the lacquer being transferred from the fountain roller to the applicator roller either directly or through intermediate rollers to form a nip in which the lacquer tends to build up. The amount of lacquer transferred by the fountain roller per unit time is determined by a metering roller which engages the fountain roller. A sensing device located at the nip senses the level of lacquer buildup and produces an output signal upon departure of the building from an optimum level. In one embodiment of the invention the output signal is utilized to bring about a corrective adjustment in the position of the metering roller so that the buildup at the nip tends to be restored to optimum level. In another embodiment the output signal sounds an alarm and, if desired, brings the press to a stop so that the situation can be corrected before the applicator cylinder runs dry.

2 Claims, 3 Drawing Figures



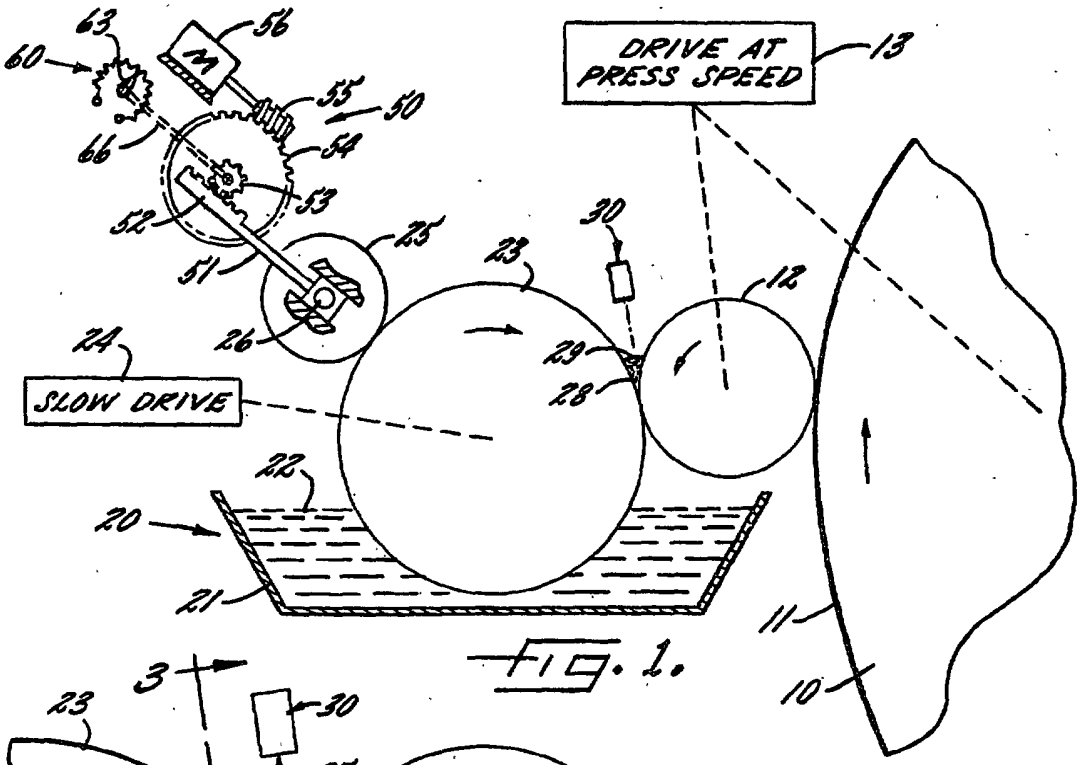


Fig. 1.

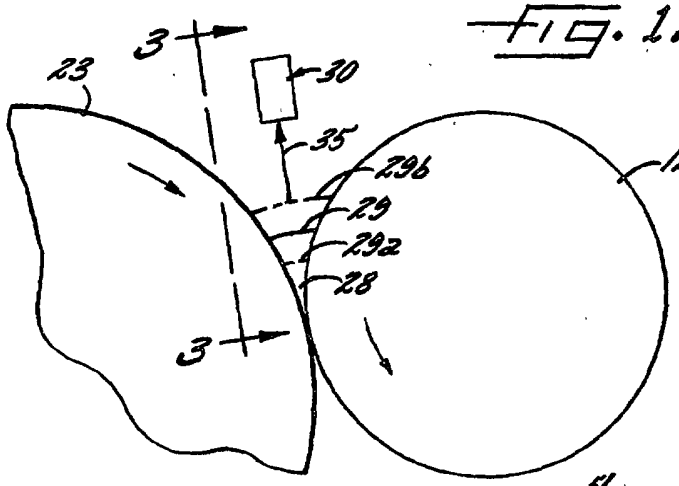


Fig. 2.

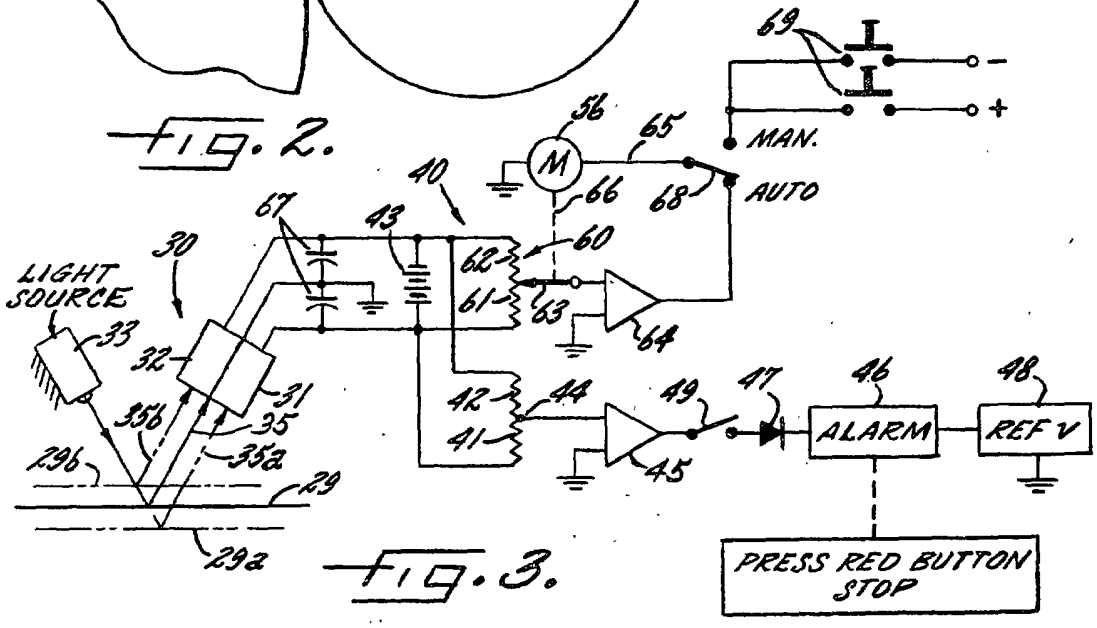


Fig. 3.

DEVICE FOR APPLYING A FLUID, IN PARTICULAR LACQUERS ON PRINTED SHEETS OR CONTINUOUS WEBS

A printing press, in addition to performing its printing function, is often utilized to apply lacquer or other coating material to the sheet. For this purpose an applicator cylinder, having a film of lacquer thereon, engages the face of the sheet as it it supported upon an impression cylinder. For the purpose of furnishing the applicator cylinder with lacquer a "scoop" or fountain roller is partially immersed in a body of lacquer contained in a tray or trough, with the rate of feed being controlled by a metering roller. An applicator roller is interposed between the fountain roller and the applicator cylinder for transfer of the lacquer from the fountain to the cylinder.

The rate of feed of the lacquer must be carefully monitored by the pressman to prevent the applicator cylinder from running dry. Should this occur, the printed material would fail to meet specifications resulting in a loss to the printer.

It is, accordingly, an object of the present invention to provide means including a sensor for monitoring lacquer buildup in a nip in the supply path and for creating an output signal when the buildup departs from an optimum level. It is a related object to provide means responsive to the variation in buildup to produce an output signal which, at the option of the user, (a) sounds an alarm, (b) shuts down the press, or (c) brings about an automatic corrective variation in the rate of feed. It is a more general object of the invention to utilize, as an indicator of feed, the buildup of lacquer or other liquid which occurs at the nip of a pair of counter-rotating rollers in the feed system.

It is another object of the present invention to provide means for monitoring the flow of lacquer or other liquid in a printing press which operates reliably and which is highly economical to install and maintain.

Other objects and advantages of the invention will become apparent upon reading the attached detail description and upon reference to the drawings, in which:

FIG. 1 is a diagram, in elevation, of a lacquer feeding arrangement in a printing press with provision for monitoring the level in a nip and for producing an output signal in accordance with the level of buildup.

FIG. 2 is a fragmentary elevation showing the buildup on an enlarged scale.

FIG. 3, viewed along line 3—3 in FIG. 2, shows a simplified system for detecting the level of buildup and for causing a departure from optimum to (a) sound an alarm, (b) stop the press drive or (c) bring about a corrective change in the rate of feed.

While the invention has been described in connection with certain perferred embodiments, it will be understood that we do not intend to be limited to the embodiments shown but intend, on the contrary, to cover the various alternative forms of the invention included within the spirit and scope of the appended claims.

Turning now to FIG. 1 there is shown an applicator cylinder **10** having a surface **11** which carries a film of lacquer for application to a sheet mounted upon a cooperating impression cylinder (not shown). In rolling engagement with the applicator cylinder is an applicator roller **12**, the surfaces of the roller and cylinder being operated at "press speed" by a drive **13**.

For the purpose of furnishing lacquer to the applicator cylinder, a fountain **20** is provided having a tray or trough **21** containing a body of the lacquer **22**. Partially submerged in the lacquer is a fountain roller **23** which is rotated at slow speed by a drive **24**. On the "emerging" or left-hand side of the fountain roller **23** is a metering roller **25** having a shaft **26** which is journalled in a bearing **27**. Applicator roller **12** and fountain roller **23**, rotating in opposite directions, meet at a nip **28**. There tends to accumulate, in the nip, a buildup of lacquer indicated at **29**, which buildup has an optimum level, indicating an adequate rate of feed, during normal operation. When the buildup exceeds the optimum condition "runover" tends to occur, and when the buildup is less than optimum there is risk that the applicator cylinder **11** will run dry so that the sheets which are produced will be uncoated and therefore unsalable.

In accordance with the present invention a sensing device is located opposite the nip **28** for constantly monitoring the level of buildup and for producing an output signal, utilized by the pressman, when the buildup departs from optimum. The sensing device, indicated at **30**, may take various forms without departing from the invention. For example, the sensing device may be of the optical type as illustrated in FIG. **3** consisting of adjacent photocells **31, 32** illuminated by a light source **33**. The light source produces a beam **34** which is specularly reflected from the surface of the buildup along path **35**. When the level of buildup **29** is optimum, the light reflected into the photocells **31, 32** will be equal and no output signal will be produced. The level of buildup may fall to the level **29*a*** which causes the reflective path to switch to position **35*a*** which favors the photocell **31**. Such condition produces an output signal for the sounding of an alarm or the like. Alternatively, the buildup may rise to the level **29*b*** resulting in a reflection path **35*b*** which favors the photocell **32**. This also produces an output signal which results in corrective action being taken.

In carrying out the invention a bridge circuit is provided for responding to unbalance between the two photocells and for producing an output signal in accordance therewith. This bridge circuit, indicated at **40**, has the photocells **31, 32** in its first two legs and resistors **41, 42** in third and fourth legs, respectively. The bridge is energized by a battery **43**. Thus, under conditions of unbalance an output signal exists at output terminal **44**. The output voltage is amplified by an amplifier **45**, the output of which energizes an alarm device **46**. An interposed diode **47** ensures that the alarm is sounded only in response to a falling level. The point of triggering of the alarm is determined by including, in series, an adjustable source of reference voltage **48**. The alarm circuit is turned on by a switch **49**.

In operation, and with the bridge initially balanced, the level is at **29** and there is a complete absence of output signal. However, if for any reason the level at the nip should fall, say to the level **29*a***, the photocell **31** is favored as compared to the photocell **32** resulting in an output signal at output terminal **44** which, amplified by amplifier **45** and with favorable polarization at diode **47**, the alarm **46** sounds alerting the pressman to check both the rate of feed in the system and the level of the body of lacquer in the tray **21**.

If desired, the alarm device **46** may be coupled to the dropout circuit of the press drive **13**, as shown in FIG. **3**, in such a way that the alarm condition is effective to trigger a "red button stop", bringing the press quickly

to a halt and signifying that corrective action should be urgently taken.

In accordance with one of the aspects of the present invention the output signal from the bridge circuit **40** may be utilized to bring about a corrective change in the rate of feeding of the lacquer by the fountain roller **23**. This is brought about by an electro-mechanical servo system **50**, the mechanical portion of which is set forth in FIG. **1**. Thus, the bearing **27** which supports the shaft of the metering roller **25** is slidably mounted in ways formed in the frame of the machine and positioned by a plunger **51**. The plunger **51** is connected to a rack **52** which is driven by a pinion **53** coupled to a gear **54**. The latter is rotatable by a worm **55** driven by a reversable motor **56**. All that need be said about the motor is that it is capable of driving in opposite directions depending on the polarity of the control signal.

To produce an output signal the bridge **40** is terminated in a potentiometer **60** having legs **61**, **62** and a wiper **63**. The wiper is connected to the input of an amplifier **64** having an output lead **65** which drives the motor **56**. The mechanical output of the motor is coupled by a connection **66** (see also FIG. **1**) to the wiper **63** of the potentiometer. Capacitors **67** respectively connected across the photocells **31**, **32** have an averaging effect and make the system nonresponsive to transient changes in level and, more particularly, to transient departures from the horizontal.

The servo system is turned on by a switch **68** which is capable, also, of switching push-buttons **69** into the circuit for manual control.

It will be assumed that initially the buildup is horizontal and at the level indicated at **29**. It will further be assumed that the bridge, under such conditions, is balanced so that the motor **56** is de-energized. Upon a drop in the level of buildup from **29** to **29***a*, the reflected beam switches to position **35***a* causing more of the reflected light to enter photocell **31** than enters photocell **32**. This unbalances the bridge causing an output signal to exist at the bridge terminal **63**, which signal is fed to the amplifier **64**. The amplified signal is applied, by line **65**, to the motor **56** causing the motor to rotate in the direction which produces backing off of the plunger **51** thereby creating additional clearance between the fountain roller **23** and the metering roller **25** allowing lacquer to be transported at a greater rate to the nip **28**. At the same time the motor, through connection **66**, causes movement of the slider **63** on potentiometer **60** to rebalance the bridge circuit so that the signal fed through the amplifier **64** to the motor **56** is reduced to zero, turning off the motor.

The increased rate of flow of the lacquer causes the buildup to be restored from the low level **29***a* to the optimum level **29**. Any tendency of the level to exceed the level **29**, causing a rise in the level of buildup to the level **29***b*, results in a switch of the reflected beam to the path **35***b* which causes more light to be transmitted to photocell **32** than is transmitted to photocell **31**. This results in an output signal at output terminal **63** of the bridge which is opposite to that previously produced and which, amplified by the amplifier **64**, causes the motor **56** to rotate in the opposite direction, that it, in a direction to slightly close down the metering roller **25** reducing the flow of lacquer to the nip **28** and, simultaneously, through connection **66**, rebalancing the bridge so that the level of buildup does not substantially exceed the level **29**. This constitutes a "hunting" type of control in which the level of buildup swings slightly above and slightly below the optimum level **29** so that the flow of lacquer to the applicator roller and applicator cylinder is, on the average, at an optimum rate.

While the invention has been described in connection with a sensor **30** which works on an optical, or reflective, principle, it will be apparent to one skilled in the art that the invention is not limited thereto and that other sensors **30**, arranged opposite the nip **28** for response thereto and capable of producing an output signal which varies in accordance with a departure in buildup from the optimum level, may be substituted without departing from the present invention.

In the arrangement described it is preferable for the fountain, or scoop, roller **23** and the applicator cylinder **11** to be hard surfaced while the applicator roller **12** and metering roller **25** are resiliently surfaced.

Although the invention has been described in connection with a highly simplified arrangement in which there is direct transfer of lacquer from the fountain, or scoop, roller **23** to the counter-rotating applicator roller **12**, to produce the buildup **29**, it will be understood that the invention is not limited to such simplified form and, if desired, additional roller may be interposed between the fountain roller and applicator roller and driven at a surface speed corresponding to one of them, for creation of a nip having a region of buildup which is monitored by a sensing device **30** as described.

The term "signalling means" as used herein refers to any means capable of attracting the attention of the pressman or for bringing about a corrective change in the rate of feed.

We claim:

1. In a printing press the combination comprising an applicator cylinder for receiving a film of lacquer from an associated counterrotating applicator roller, means for driving the cylinder and applicator roller at press speed, a fountain supplying the lacquer and having a fountain roller partially immersed in a reservoir of lacquer disposed below said fountain roller, means for driving the fountain roller so that it picks up a coating of lacquer from said reservoir, said fountain roller engaging the applicator roller so that some of the lacquer is transferred from the fountain roller to the applicator roller, a metering roller engaging the fountain roller, means for adjusting the transaxial spacing between the metering roller and the fountain roller so that a film of regulated thickness is applied to and transferred by the applicator roller, said fountain roller driving means being operable to drive said fountain roller in a counterrotative direction with respect to the applicator roller with the contacting applicator roller and cylinder surfaces being rotated upwardly at the nip between the applicator roller and the cylinder so that there is no significant buildup of lacquer at the nip between the applicator roller and the cylinder and with the contacting fountain roller and applicator roller surfaces being rotated downward at the nip between the fountain roller and the applicator roller so that the lacquer tends to buildup at the nip between the fountain roller and the applicator roller, the engagement of the fountain roller and the applicator roller causing a desired thickness of lacquer to be transferred to the cylinder when the buildup of lacquer is at an optimum level in the nip between the fountain roller and applicator roller, means including a sensing device located at the nip between the fountain roller and applicator roller for sensing said buildup of lacquer and for producing an output signal upon departure of the buildup from an optimum level,

and means responsive to an input signal from the sensing device for acting upon the adjusting means to bring about a corrective adjustment in the position of the metering roller with respect to the fountain roller so that said lacquer buildup in the nip tends to be restored to the optimum level.

2. The combination as claimed in claim 1 further comprising means responsive to the sensing device for emitting a warning signal when the fluid buildup drops substantially below the optimum level.

* * * * *

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US005280750A

United States Patent [19]

Yoshida et al.

[11] Patent Number: 5,280,750

[45] Date of Patent: * Jan. 25, 1994

[54] INK FOUNTAIN APPARATUS

[75] Inventors: Kouichi Yoshida, Tokyo; Kenji Kusunoki, Kanagawa, both of Japan

[73] Assignee: Kabushiki Kaisha Tokyo Kikai Seisakusho, Japan

[*] Notice: The portion of the term of this patent subsequent to Oct. 25, 2008 has been disclaimed.

[21] Appl. No.: 521,234

[22] Filed: May 9, 1990

[30] Foreign Application Priority Data

May 11, 1989 [JP] Japan 1-116138
May 12, 1989 [JP] Japan 1-117249

[51] Int. Cl.[5] B41F 31/06; B41F 31/20
[52] U.S. Cl. 101/363
[58] Field of Search 101/350, 363, 364, 366, 101/365, 207, 208-210, 148; 118/259, 29

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Primary Examiner—J. Reed Fisher
Attorney, Agent, or Firm—Ronald P. Kananen

[57] ABSTRACT

An ink fountain apparatus in an ink supply system for use with a printing press. The apparatus comprises an ink reservoir provided with an ink fountain, an ink steering/collecting section formed in a zone of the ink reservoir and in which a screw adapted to stir, transfer and collect ink is rotatively mounted therein, an ink delivery section for delivering ink into the ink reservoir, and a pump installed between the ink steering/collecting section and the ink delivery section. A suction port of the pump is directly connected to an ink collecting zone of the ink steering/collecting section where ink is collected through the action of the screw.

9 Claims, 5 Drawing Sheets

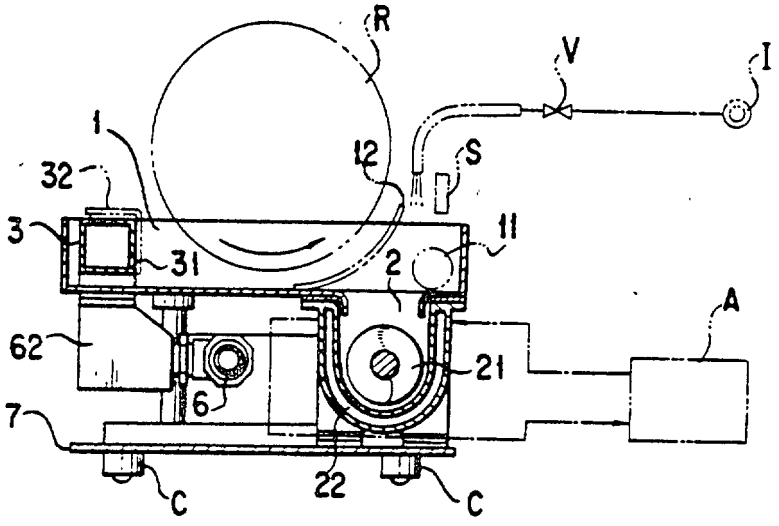
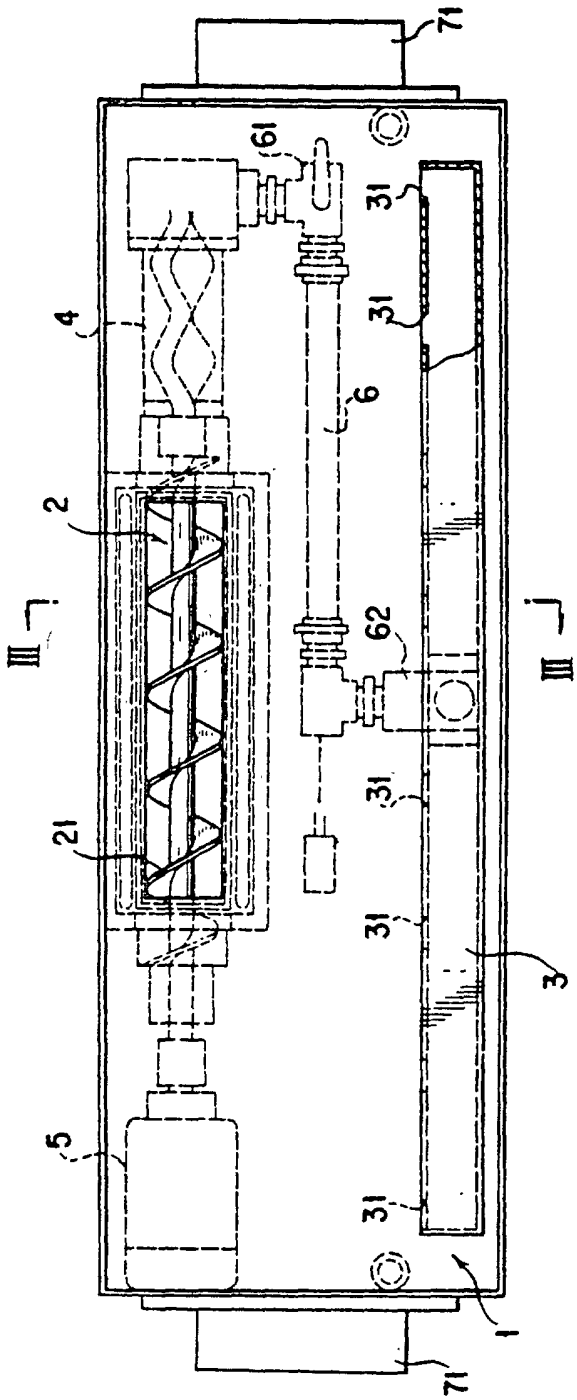


FIG. 1



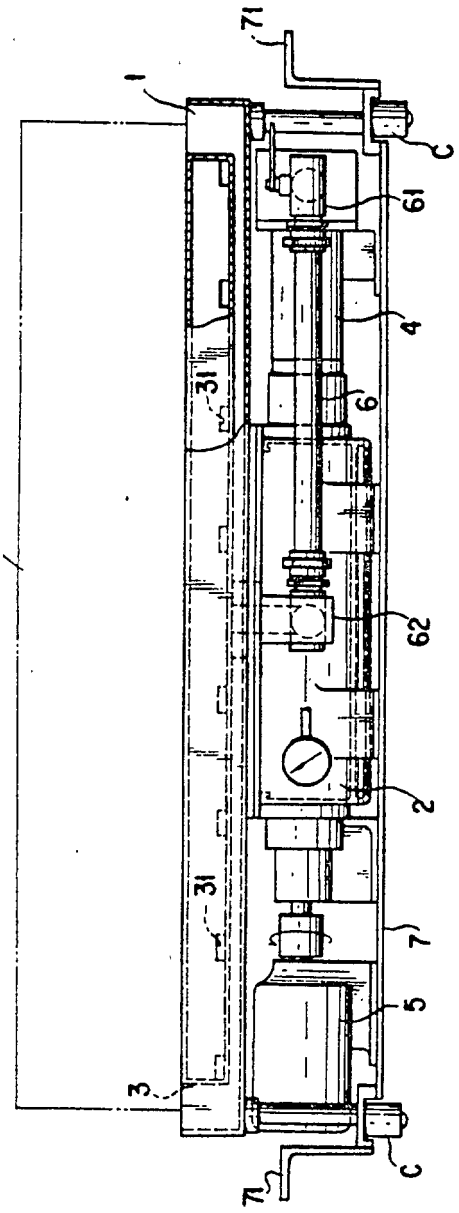


FIG. 2

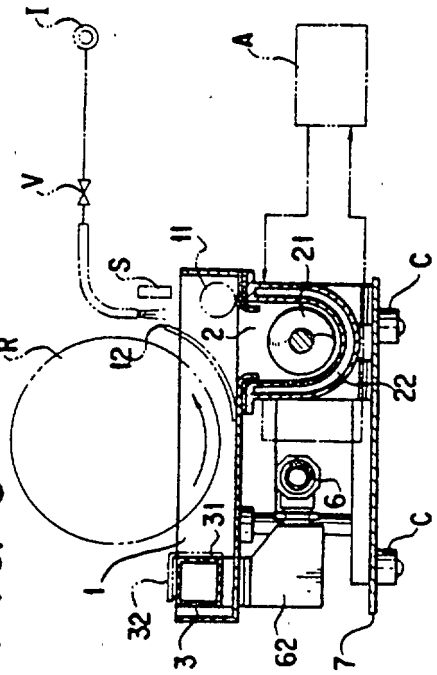


FIG. 3

FIG. 4

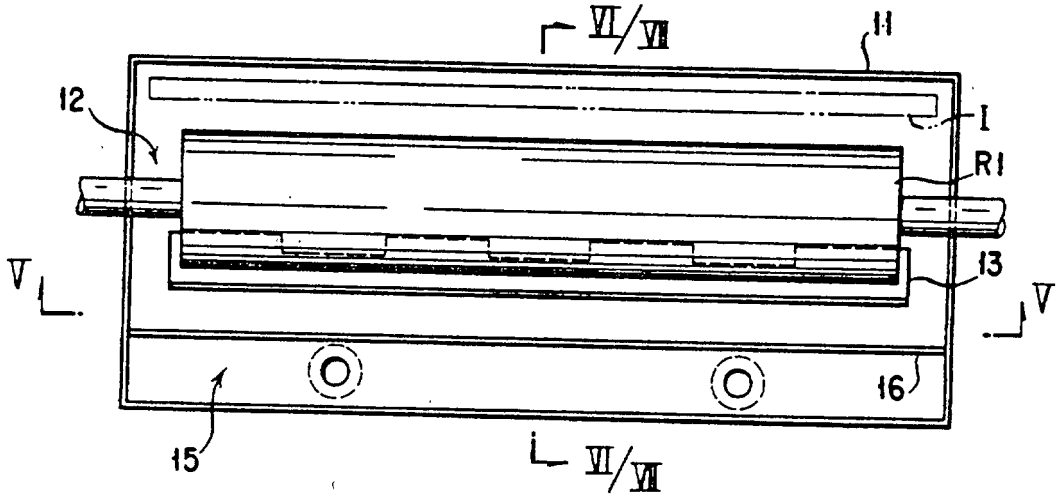


FIG. 5

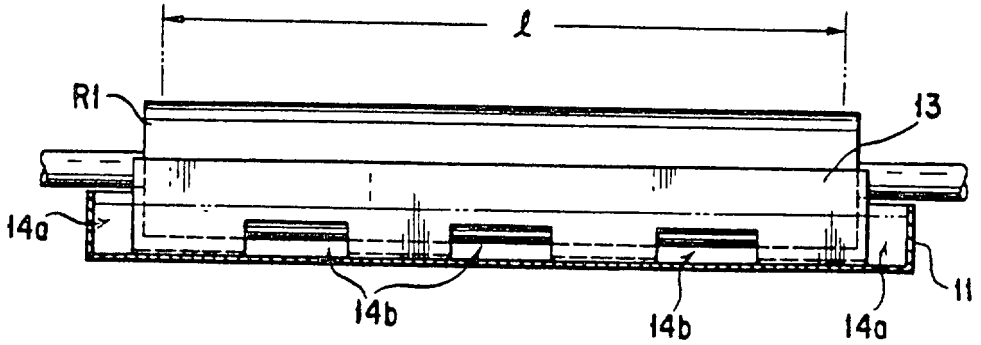


FIG. 6

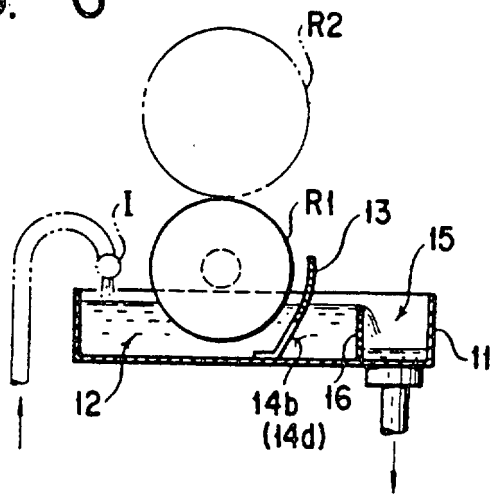


FIG. 7

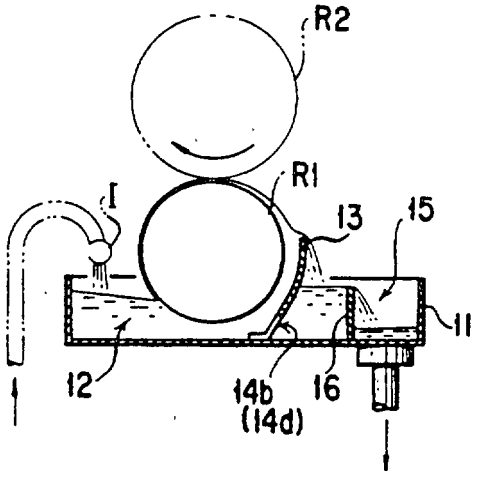


FIG. 8

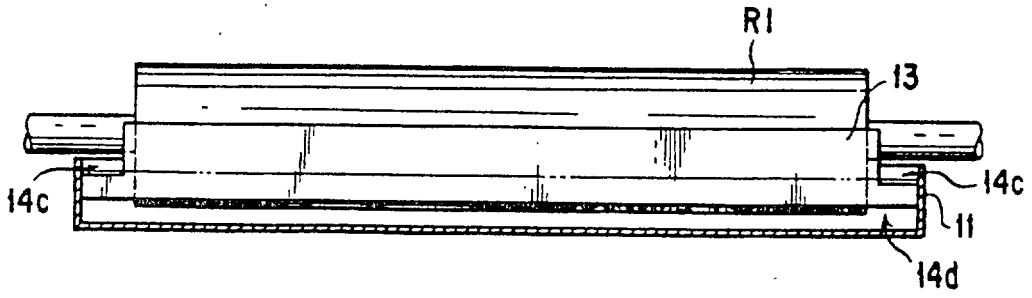


FIG. 9

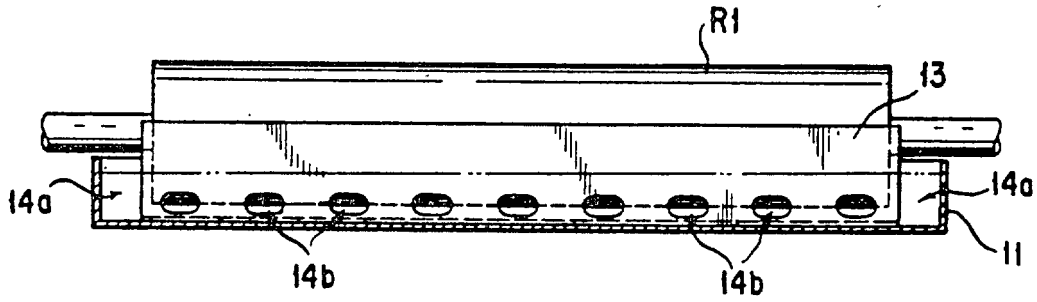
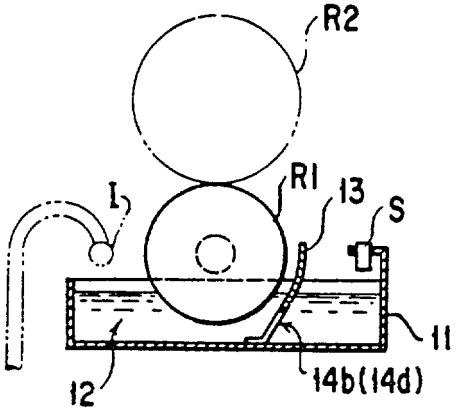


FIG. 10



INK FOUNTAIN APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to an ink fountain apparatus for use with a printing press adapted to store always a predetermined amount of ink supplied by an ink supply unit in an ink fountain thereof.

2. Description of the Prior Art

As ink fountain apparatuses, there are publicly known, for example, those described in Japanese Laid-Open Utility Model Application Nos. SHO 64-1939 and SHO 63-18244.

The ink fountain apparatus shown in Japanese Laid-Open Utility Model Application No. SHO 64-1939 comprises an ink fountain located below a fountain roller; an ink nozzle mounted in the ink fountain so as to be oriented to the peripheral surface of the fountain roller; an ink supply conduit connecting the ink fountain with the ink nozzle; a pump mounted in the ink supply conduit; and an ink stirring conduit branched downstream of the pump in the ink supply conduit and connected to the bottom of the ink fountain, the arrangement being made such that the ink stored in the ink fountain can be supplied by the pump into the ink nozzle through the ink supply conduit, and as occasion demands, a stirring effect can be given to ink by circulating it through the ink stirring conduit.

Further, Japanese Laid Open Utility Model Application No. SHO 63-18244 discloses an ink tank apparatus wherein the ink stored in an ink tank is collected through the action of a screw, and the ink thus collected is supplied by a pump into an ink delivery nozzle mounted opposite to an ink supply roller through an ink supply conduit, and a surplus amount of ink is recovered into the ink tank.

It is known that pressure loss ΔP which occurs when a fluid having a viscosity μ is pressurized by a pump and transferred in a laminar flow through a pipe having a diameter "D" and a length "l" is represented by a formula $\Delta P = 128\ \mu lQ/\pi D^4$ wherein Q is the flow rate of the fluid. Stating in brief, it is known that the higher the viscosity of the fluid, and the longer the length of the pipe, and further the more the flow rate of the fluid, the higher the pressure loss becomes thus rendering the fluid transfer difficult, whilst the larger the pipe diameter, the lower the pressure loss becomes.

In the above-mentioned ink fountain apparatuses, however, all passages through which the ink stored in an ink reservoir section is transferred by a pump and which extend between the ink reservoir section and the pump and also between the pump and an ink receiving section are formed by conduits having small diameters. Therefore, in order to ensure that a sufficient amount of ink is delivered by the nozzle, the provision of a pump having a comparatively large capacity capable of covering such a pressure loss in the pipe and a driven unit having a relatively large capacity was required, and also it was necessary to provide a comparatively large space for installation of pipings. Therefore, it was difficult to make the configuration of the above-mentioned ink fountain apparatus small-sized and compact.

Still further, the use of a pump in the condition that relatively high pressure losses occur has expedited damage of the pump, thus reducing the life-time thereof.

Whilst, as ink fountains, there are publicly known those described in Japanese Laid-Open Patent Application Nos. SHO 35-12862, SHO 39-5717 and SHO 59-393.

These publicly known ink fountains are arranged such that the ink supplied from an ink tank provided separately in an amount more than the actual consumption is caused to overflow from an intermediate partition so that a pre-determined amount of ink can always be stored therein. And, the level of the ink stored in the ink fountain is arranged to be kept lower than end shafts of a roller which is rotated while it is partially immersed in the ink in the ink fountain.

As described above, since the level of the ink stored in the prior art ink fountain is arranged to be kept lower than end shafts of a roller which is rotatively driven while it is partially immersed in the ink in the ink fountain, only less than the half of the peripheral surface of the above-mentioned roller is immersed in the ink in the ink fountain. Therefore, the ink which is desposited on the peripheral surface of the roller while it is partially immersed in ink and which comes out of the surface of ink, as the roller is rotated, tends to drop from the peripheral surface owing to mechanical vibrations, etc. during its passage to a downstream roller which is engaged with or located close to the fountain roller. This caused fluctuations in the amount of ink to be supplied to the above-mentioned downstream roller so that uniform quality of printing could not be achieved. Further, in worst cases, a sufficient amount of ink required for printing could not be supplied. Such difficulties have frequently occurred when dampening water made ingress into the ink supply passage in lithography using a highly viscous ink and dampening water.

SUMMARY OF THE INVENTION

The present invention has been devised in view of the above-mentioned circumstances and to solve various problems encountered in the prior art, and has for its first object to provide an ink fountain apparatus wherein the length of the ink supply conduit in the ink supply system is substantially reduced.

Another object of the present invention is to provide an ink fountain apparatus wherein the distance over which the peripheral surface of a fountain roller immersed in the ink stored in an ink fountain is moved after it comes out of the surface of ink as it is rotated, until it comes into contact with a downstream roller located downstrem of the ink supply passage; that is; the ink deposited thereon is supplied or transferred to the downstream roller is reduced.

To achieve the above-mentioned objects, according to a first aspect of the present invention, there is provided an ink fountain apparatus in an ink supply system for use with a printing press comprising: an ink reservoir provided with an ink fountain; an ink stirring and collecting section form in a zone of the ink reservoir section and in which a screw adapted to stir, transfer and collect ink is rotatively mounted therein; and an ink delivery section adapted to deliver ink into the ink reservoir section in which it is stored; and a pump installed between the ink stirring and collecting section and the ink delivery section, the suction port of the pump being directly connected to an ink collecting zone of the ink stirring and collecting section where ink is collected through the action of the screw.

According to a second aspect of the present invention, there is provided an ink fountain apparatus as set forth in the above-mentioned first aspect, characterized

in that the ink fountain comprises an intermediate plate mounted in the vicinity of the peripheral surface of a fountain roller on the side wherein it comes out of the surface of ink stored in the ink reservoir section as it is rotated, the top edge of the intermediate plate being always kept higher than the level of the ink stored in the ink reservoir section.

According to the present invention incorporating the above-mentioned aspects, when the screw is rotated, the ink stored in the ink reservoir section is transferred to the ink collection zone where the leading end of the screw is located and collected there. And, the pump whose suction port is directly connected to the leading end of the screw will draw in the ink thus collected and discharge it into the ink delivery section. The ink delivered by the ink delivery section is stored in the ink reservoir section.

During the above-mentioned process, turbulent flow of ink is casued by the transfer and collecting action of the screw thus giving a stirring effect to ink.

As a result, the pressure loss of ink which occurs when it is supplied through ink conduits is reduced so that the capacity of the pump for supplying ink can be reduced, and hence the capacity of the driver unit can also be reduced correspondingly, thus achieving a considerable reduction in the space required for installing the ink supply system for use with a printing press. Further, the above-mentioned reduction in the pressure loss will reduce the loading on the pump and hence the damage of the pump so that the frequency of maintenance and repairs of the pump can be reduced, thus increasing the life-time thereof.

Further, in the supply of ink by rotating the fountain roller partially immersed in ink stored in the ink fountain, the frequency of dropping of ink during the period wherein the peripheral surface of the fountain roller comes out of the surface of ink and then reaches a supply position where the ink deposited thereon is supplied to the peripheral surface of the downstream roller is remarkably reduced. Further, even if such dropping of ink occurs, recovery to the original conditions will be made so that the fluctuations in the amount of ink to be supplied to the downstream roller can be reduced to such a degree which does not affect the quality of printing. Still further, the rise of the level of ink in the space between the peripheral surface of the fountain roller and the intermediate plate becomes enhanced particularly with highly viscous ink. Therefore, an improved effect could be achieved in lithoprinting using ink having a comparatively high viscosity which has caused difficulties in use, and also dampening water.

The above-mentioned and other objects, aspects and advantages of the present invention will become apparent to those skilled in the art by making reference to the following detailed description and the accompanying drawings in which preferred embodiments incorporating the principles of the present invention are shown by way of example only.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic plan view showing one embodiment of the ink fountain apparatus according to the present invention;

FIG. 2 is a schematic front view of the embodiment shown in FIG. 1;

FIG. 3 is a sectional view taken along line III—III in FIG. 1;

FIG. 4 is a schematic plan view showing one embodiment of the ink fountain apparatus according to the present invention;

FIG. 5 is a sectional view taken along line V—V in FIG. 4;

FIGS. 6 and 7 are sectional views taken along lines VI—VI and VII—VII, respectively, FIG. 6 showing a fountain roller in non-rotating condition, whilst FIG. 7 showing the same in rotating condition;

FIGS. 8 and 9 are front views of principal parts showing other embodiments of the ink fountain apparatus having intermediate plates whose configurations are different from that of the intermediate plate used in the embodiment of FIG. 4; and

FIG. 10 is a schematic sectional view showing a side portion of a further embodiment of the ink fountain according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention will now be described in detail below by way of several preferred embodiments thereof with reference to the accompanying drawings.

In the first place, an ink fountain apparatus of the present invention will be described with reference to FIGS. 1 to 3.

This ink fountain apparatus comprises an ink reservoir section including an ink fountain adapted to store ink in which a fountain roller R out of a group of inking rollers (not shown) for use in a printing machine, not shown; an ink stirring and collecting section 2 formed by projecting a portion of the bottom part of the ink reservoir section 1 downwardly and having a screw 21, adapted to be rotatively driven by a driver, installed therein; a pump 4 whose suction port is directly connected to a zone in the ink stirring and collecting section 2 where ink is collected through the action of the screw 21 and whose discharge port is connected by a piping system to an ink delivery section 3 which will be described below; and the ink delivery section 3 arranged to deliver the ink supplied by the pump 4 through ink delivery parts 31, 31 . . . into the ink reservoir section 1. The ink fountain apparatus 1 is fixedly mounted, for example, on a bed 7.

Further, the ink stirring and collecting section 2 has a hollow section 2 which is formed integrally on the outer wall thereof and through which a constant temperature fluid to maintain the temperature of the ink stored in the ink fountain apparatus at an approximately predetermined value is circulated by a constant temperature fluid circulation system "A" which can be connected and disconnected by a plug, not shown. Further, in the embodiment shown, the pump 4 has a rotor shaft whose one end passes through the suction port and is connected to the shaft of the screw 21 so that it can be driven by the driver or prime mover 5 through the shaft of the screw 21. Therefore, the pump driving system is shown as having an extremely compact configuration. However, the screw 21 and the pump 4 may be driven by separate or different drivers, respectively, or as an alternative, a pump of a different type (not shown) may be used to achieve the same purpose.

In the above-mentioned arrangement, ink is stored up to a predetermined range of level in the ink reservoir section 1, and also the ink fountain apparatus is mounted on a printing machine (not shown) in such a manner that the fountain roller R is partially immersed in the ink stored in the ink reservoir section 1 and can be rotated

therein. In case, as in the embodiment shown, the bed 7 is provided with casters C and can be independently moved relative to the printing machine, not shown, for example, mounting members 71 are engaged with a proper elevator means (not shown) mounted on the printing machine so that the fountain apparatus is lifted to a predetermined position and fixed there.

Subsequently, the driver means 5 is actuated or rotated in a direction as shown, for example, by arrow in FIG. 2. As a result, the ink in the ink stirring and collecting section 2 is transferred and collected by the screw 21 towards the right hand side of the section 2 in FIG. 1. During this ink transfer and collection, a turbulent flow of ink will take place thus giving a stirring effect to the ink.

The ink which has thus been transferred and collected is drawn in by the pump 4 whose suction port is located in the ink collection zone, and then supplied through an ink supply conduit 6, which is the only one conduit in the embodiment shown, a valve 61 and a piping block 62 into the ink delivery section 3. The ink which has flown into the ink delivery section is delivered through the ink delivery ports 31, 31 . . . into the ink reservoir section 1 in which it is stored. In case it is desired to regulate the amount of the ink to be delivered through each of the ink delivery ports 31, 31 . . . , each of the delivery ports 31 may be provided with a shutter 32 as shown by two-dot chain lines in FIG. 3 so as to enable the degree of opening of each of the delivery ports 31 to be regulated. Further, ink will always flow from the ink reservoir section 1 into the ink stirring and collecting section 2 by an amount which is equivalent to that of the ink which is transferred and collected by the screw 21 in the section 2 and then supplied by the pump 4 into the ink delivery section 3.

Stating in brief, when the driver means 5 is actuated, the ink stored in the ink fountain apparatus is caused to circulate, in turn, through the ink stirring and collecting section 2, the pump 4, the ink supply conduit 6, the ink delivery section 3, the ink reservoir section 1 and then back to the ink stirring and collecting section 2. In case, during this ink circulation, the ink flow in both the left and right hand zones of the ink reservoir section 1 is inferior to those in the remaining zone, it is desirable to mount an auxiliary screw 11 as shown by two-dot chain lines in FIG. 3 so that it may be driven, and to transfer and collect ink in both the left and right hand sides of the ink reservoir section 1 to the central zone thereof.

Whilst, when the printing press (not shown) is operated, ink in the ink fountain apparatus is supplied by the fountain roller R into the printing machine and consumed thereby. To cope with the reduction of ink by consumption, arrangement is made such that a lower limit of the level of ink is detected by an ink level sensor means S provided appropriately so as to generate a detection signal, and a valve V is opened by the detection signal to thereby supply ink from an ink supply source 1 into the ink reservoir section 1. A signal for closing the valve V is generated by the ink level sensor means S when the upper limit of ink level is detected by the latter.

The ink in the ink reservoir section 1 is maintained by the above-mentioned operation at an approximately uniform property and at an approximately predetermined range of level so that a stable supply of ink to the upstream roller R which is rotated while it is partially immersed in ink can be achieved. Further, it is effective for the stabilization of the property of ink to maintain the temperature of the ink approximately constant by causing a constant temperature fluid to be circulated through the hollow portion 22 formed on the outer wall of the ink stirring and collecting section 2. Further, if and when ink is supplied by the above-mentioned ink supply source 1 directly into the ink stirring and collecting section 2, then the intermixing of the supplied ink with that stored in the ink reservoir is enhanced appreciably.

Further, an intermediate plate 12 as shown by two-dot chain lines in FIG. 1 is a weir adapted, during rotation of the fountain roller R, to rise the level of ink on the side wherein the upstream roller R comes out of the surface of ink. This intermediate plate 12 has notches or holes formed therethrough at a level lower than the level of the ink stored therein, or alternatively, so as to extend from an upper level higher than the level of ink to a lower level lower than the level of ink to thereby enable communication of ink between the two zones of the ink reservoir section 1 separated thereby to be made without impeding the ink circulation in the ink fountain apparatus. Such notches or through-holes may be provided properly as occasion demands.

In the next place, several embodiment of the ink fountain used in the above-mentioned ink fountain apparatus will be described with reference to FIGS. 4 to 10.

An ink fountain 11 has an ink reservoir section 12 capable of storing ink at an approximately predetermined range of level in which a fountain roller R1 is partially immersed. The ink reservoir section 12 has an intermediate plate 13 located at a position close to the peripheral surface of the fountain roller R1 on the side wherein the roller R_1, comes out of the surface of ink when it is rotated, and which has a sectional shape corresponding approximately to that of the fountain roller R1. This intermediate plate 13 is somewhat longer than the length L of the surface of press plate to be supplied with ink in the lengthwise direction of the peripheral surface of the fountain roller R1, nad is arranged such that the leading edge thereof may project out of the surface of ink when the ink reservoir section 12 is filled with ink up to the above-mentioned approximately predetermined level. Further, the intermediate plate 13 has communication means 14 such as notches and/or through-holes formed at least in the portion thereof to be submerged in ink. Further, in case the intermediate plate 13 is installed in such a manner that both ends thereof are kept in contact with the inner surface of the outer wall of the ink fountain 11, it is preferable to make the height of the top edges of the intermediate plate 13 on both sides thereof lower than the height of the top edge of the outer wall of the ink fountain 11, as shown in FIG. 8, to prevent overflow of ink along the intermediate plate 13 and outside of the ink fountain 11 from accurring. As a means for keeping the level of the ink to be stored in the ink reservoir section 12 within an approximately predetermined range, an intermediate partition strip 16 is provided, as shown in FIGS. 4, 6 and 7, to divide the interior of the ink fountain 11 into an ink reservoir section 12 and an ink delivery section 15 and keep the height thereof lower than that of the outer wall of the ink fountain 11. The arrangement is made such that the ink reservoir section 12 is always supplied with ink by the ink supply unit I, and the ink which overflows the intermediate partition strip 16 into the delivery section 15 may be recovered from the latter and supplied again into the ink reservoir section 12. Alternatively, it is possible to de-

tect the level of ink by means of a level sensor S, as shown in FIG. 10, and to conduct intermittently supply of ink from the ink supply unit I in response to the detection of predetermined upper and lower limits of ink level by the level sensor. As a further alternative, use of the above-mentioned two methods in combination may be made, or other proper means may be used.

The supply of ink by the above-mentioned ink fountain 11 is made as follows.

The ink fountain 11 is combined appropriately with a printing press, not shown, in such a manner that fountain roller R1 may be partially immersed in ink when it is filled with ink. In this condition, the fountain roller R1 is rotated in a direction as shown by arrow in FIG. 7. Thereupon, the ink deposited on the peripheral surface of the portion of the fountain roller R1 immersed in ink comes out of the surface of ink as it is when the roller R1 is rotated, and is transferred onto a downstream roller R2 which is engaged with or located close to the fountain roller R1. In that case, at a position where the fountain roller comes out of the surface of ink, ink will rise since it is guided endlessly by the fountain roller R1, and at length the trailing end of the rising ink will reach the intermediate plate 13 mounted close to the fountain roller R1. Consequently, formed in the space enclosed by the peripheral surface of the fountain roller R1 and the intermediate plate 13 is a new ink surface which is supported by both the peripheral surface of the fountain roller R1 which is displaced upwardly by the rotation thereof and the intermediate plate 13 and which is higher than the level of ink in the remaining section. When the formation of this new ink surface continues, the new ink surface will reach the leading edge of the intermediate plate 13, as shown in FIG. 7, so that the portion of the peripheral surface of the fountain roller R1 which comes out of the surface of ink in the ink revervoir section 12 is kept to be immersed in ink up to a position higher than the normal level of ink stored in the ink reservoir section 12. Therefore, the distance over which the peripheral surface of the fountain roller R1 immersed in ink is moved after it comes out of the surface of ink until the ink deposited thereon is supplied or transferred to the peripheral surface of the downstream roller R2 is reduced substantially. As a result, a marked reduction in the frequency of dropping of ink from the peripheral surface of the fountain roller R occurs, and even if dropping of ink takes place, the distance over which ink drops is short, and so quick recovery to the original conditions will be made quickly.

Whilst, the lower edge of the intermediate plate 13 is located at a position lower than normal level of ink stored in the ink reservoir section 12. And, as shown in FIGS. 5 and 9, both left and right side portions of the intermediate plate 13 are each cut off by a predetermined lengthwise width so as to form first communication openings 14*a* therein, and also second communication openings 14*b* comprised of a plurality of notches and/or through-holes in the lower part of the intermediate plate 13 located below the level of the ink stored in the ink reservoir section 11. As shown in FIG. 8, the above-mentioned first communication openings 14*a* may be comprised of notches 14*c* formed by cutting off both left and right side portions of the intermediate plate 13 so as to keep both cut-off side portions somewhat lower than the level of the ink in the ink reservoir section 11. Further, the above-mentioned second communication openigns 14*b* may be compirsed of a continuous hole 14*d* formed by cutting off the intermediate plate 13 by a predetermined lengthwise width. Consequently, there is almost no hindrance to the flow of the ink supplied by the ink supply unit I within the ink reservoir section 12. Further, in FIGS. 5, 8 and 9, respectively, the level of the ink stored in the ink reservoir section 11 is indicated by two-dot chain lines. In consequence, the level of the ink stored in the ink reservoir section 12 is not subject to large influences by the fluidity of the ink and by whether the fountain roller R1 is rotating or not. Stating in brief, there is no possibility of occurrence of marked changes in the level of the ink stored in the ink reservoir section 12 of the ink fountain 11 with the exception of the level of ink to be created in the space between the fountain roller R_1 and the intermediate plate during rotation of the roller R1.

It is to be understood that the foregoing description is merely illustrative of preferred embodiments of the present invention, and that the present invention is not to be limited thereto, but is to be determined by the scope of the appended claims.

What is claimed is:

1. An ink fountain apparatus in an ink supply system for use with a printing press, comprising:

an ink reservoir section provided with an ink fountain section having an outer wall;

an ink stirring and collection section having an ink collecting zone formed in a zone of the ink reservoir section;

a screw located and rotatively mounted in said ink stirring and collecting section and which is structurally adapted to stir, transfer and collect ink

an ink delivery section cooperating with said ink reservoir section and adapted to deliver ink into said ink reservoir section in which it is stored;

a pump located between said ink stirring and collecting section and said ink delivery section, said pump having a suction port directly connected to an ink collecting zone of the ink stirring and collection section where ink is collected through the action of said screw;

a rotatable fountain roller having a peripheral surface, at least a portion of which is immersed in ink stored in the ink reservoir section; and

an intermediate plate mounted in a close vicinity of the peripheral surface of the fountain roller wherein the fountain roller exits from the surface of ink stored in the ink reservoir section as the fountain roller is rotated, a top edge of the intermediate plate being located higher than a level of ink stored in the ink reservoir section, and a bottom edge of the intermediate plate being kept lower than the lever of ink.

2. An ink fountain apparatus as claimed in claim 1, wherein said intermediate plate has first communication means formed in a zone thereof below the source of the ink stored in the ink reservoir section.

3. An ink fountain apparatus as claimed in claim 1, wherein the height of the top edge of said intermediate plate on each lengthwise side thereof is lower than the height of the top edge of the outer wall of said fountain and also lower than the level of the ink stored in the ink reservoir section so as to form first communication means in the intermediate plate.

4. An ink fountain apparatus as claimed in claim 3, wherein said first communication means is comprised of a plurality of notches formed in the bottom edge of said intermediate plate.

5. An ink fountain apparatus as claimed in claim 3, wherein said first communication means is comprised of a plurality of through-holes formed in the bottom edge of said intermediate plate.

6. An ink fountain apparatus as claimed in claim 3, wherein said first communication means is a lengthwise elongated hole defined by cutting off the lower part of said intermediate plate.

7. An ink fountain apparatus as claimed in claim 1, wherein said intermediate plate has first communication means formed in a zone thereof below the surface of the ink stored in the ink reservoir section, and both left and right side portions of said intermediate plate are each terminated by a predetermined lengthwise width to form second communication means.

8. An ink fountain apparatus as claimed in claim 7, wherein said first communication means is comprised of a plurality of notches formed in the bottom edge of said intermediate plate.

9. An ink fountain apparatus as claimed in claim 7, wherein said first communication means is comprised of a plurality of through-holes formed in the bottom edge of said intermediate plate.

* * * * *

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United States Patent [19]

Simeth

[11] **Patent Number: 4,882,991**

[45] **Date of Patent: Nov. 28, 1989**

[54] **CHANGE-OVER INKING UNIT OF A SHEET-FED ROTARY PRESS**

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[21] Appl. No.: **296,356**

[22] Filed: **Jan. 10, 1989**

Related U.S. Application Data

[63] Continuation of Ser. No. 90,117, Aug. 27, 1987, abandoned.

[30] **Foreign Application Priority Data**

Aug. 27, 1986 [DE] Fed. Rep. of Germany 3629081

[51] **Int. Cl.**[4] **B41F 31/10; B41F 31/30**

[52] **U.S. Cl.** **101/350; 101/352**

[58] **Field of Search** 101/349, 351, 352, 350, 101/148, 363, 207, 208-210

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[57] **ABSTRACT**

A sheet feed rotary press having a main ink feed unit and a plate cylinder, at least one of a plurality of transfer and applicator rolls coupled between the main ink feed unit and the plate cylinder being moveable to an inoperative position for selectively isolating a relatively short length group of applicator and transfer rolls from the main ink feed unit, and an additional quick acting ink feed unit that is selectively moveable into engagement with the short length roll group for supplying lesser quantities of ink to the plate cylinder through a shortened path via the short length roll group.

5 Claims, 1 Drawing Sheet

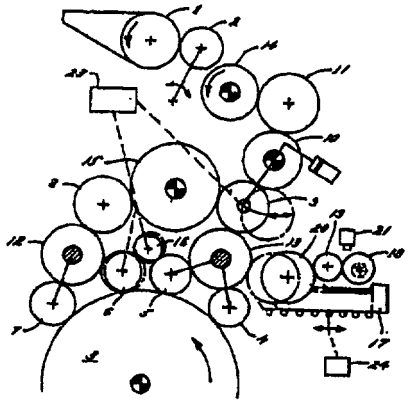

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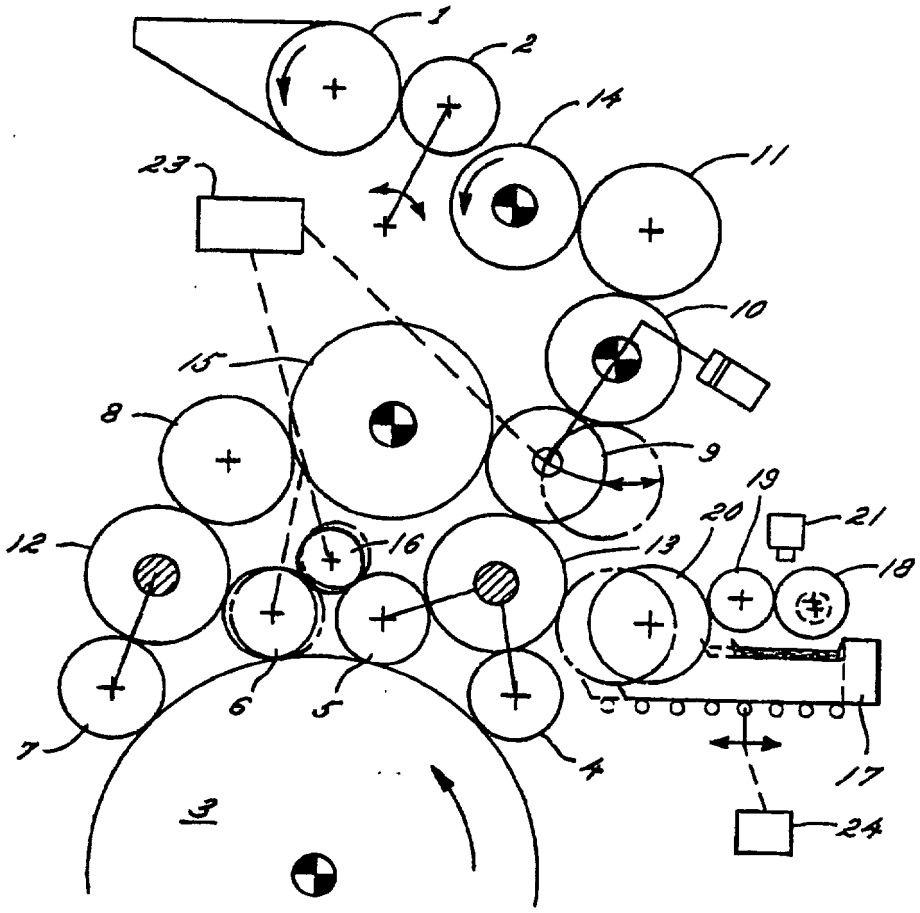
FIG. 1



CHANGE-OVER INKING UNIT OF A SHEET-FED ROTARY PRESS

This application is a continuation of application Ser. No. 090,117, filed Aug. 27, 1987, now abandoned.

The present invention relates to change over inking units for sheet feed rotary presses.

Devices of this kind are known, as described in the introductory portion of German patent AS 1 234 739. A disadvantage of these known devices is that upon the interruption or completion of a printing operation they are not adapted to quickly supply small amounts of ink to a relatively few sheets, as commonly required for proof situations, for example, to assess register or control adjustments or the like. Known change over ink units react relatively slowly, requiring the ink passage through a long line of transfer rolls to build up the requisite ink-water equilibrium and to establish the desired layer density for transfer to the plate cylinder.

It is an object of the present invention to provide a change over inking system adapted to obviate disturbances of the ink-water equilibrium or ink layer density in the ink transfer rolls, as commonly occurs in the known change over inking units during run-on following completion or interruption of a printing operation.

Another object to provide a change over inking system as characterized above that includes a more quickly responsive short length inking unit that can be used for proof situations and minimum ink consumption printing when the main inking unit of the press is not operating or is unneeded.

Other objects and advantages of the invention will become apparent upon reading the following detailed description and upon reference to the drawings, in which:

FIG. 1 is a diagrammatic illustration of an illustrative sheet fed rotary printing press having a change over inking unit embodying the present invention.

While the invention is susceptible of various modifications and alternative constructions, a certain illustrated embodiment thereof has been shown in the drawings and will be described below in detail. It should be understood, however, that there is no intention to limit the invention to the specific form disclosed, but on the contrary, the intention is to cover all modifications, alternative constructions and equivalents falling within the spirit and scope of the invention.

Referring now more particularly to the drawings, there is shown an illustrative sheet fed rotary printing press embodying the invention. The printing press includes a plurality of applicator rolls 4–7 and plurality of transfer rolls 8–16 which are interposed between a first or main ink feeder, for example, a duct roll 1 and a vibrator roll 2, and the printing forme, for example, on a plate cylinder 3. During normal printing operations, when normal to maximum ink consumption is required, ink is transferred from the duct roll 1 and vibrator roll 2, through the transfer rolls 14, 11 and 10 to the transfer roll 9. From the transfer roll 9, ink is transferred through the transfer roll 13 to the applicator rolls 4 and 5 and also through the transfer rolls 15, 8 and 12 to the applicator rolls 5 and 6. The transfer roll 16 in this case is a connecting roll between applicator rolls 5 and 6. As is known in the art, such ink transfer smooths the ink to the desired density for transfer to the applicator rolls and printing form.

Selected groups of the transfer and applicator rolls preferably remain permanently engaged at all times. In this instance, transfer rolls 14, 11 and 10 are permanently engaged, transfer rolls 15, 18 and 12 are permanently engaged with applicator roll 7, and transfer rolls 13, 16 and applicator rolls 4, 5, and 6 remain engaged at all times.

Selectively operable means are provided for interrupting the flow of ink to the applicator rolls 4–7 from the main inking unit 1, 2 upon cessation or completion of the printing operation. In this instance, means, diagrammatically indicated at 23, are provided for moving the transfer roll 9 to an inoperative position disengaged from transfer rolls 15 and 13, as shown in phantom, and for moving the transfer roll 16 and applicator roll 6 out of engagement with transfer roll 12, while they respectively maintain contact with the cylinder roll 3 and applicator roll 5, again as shown in phantom. It will be appreciated that such moving means may be of a known type, such as eccentric mountings for the movable rolls, pneumatic cylinders, pivoted levers or the like, which are effective to separate transfer rolls 9 and 13 and rolls 12 and 6 to in effect isolate a relatively short length roll group 4–6, 13 and 16 from the main ink feeder. It will be understood that the rolls 4–6, 13 and 16 which form the short length inking roll group could be mounted in an inking unit frame, which, for example, could be pivoted about a central axis for the plate cylinder 3 or otherwise be moved as a unit during a change over operation.

In accordance with the invention, additional ink feeding means is provided which is selectively movable into operative relation with the short length roll group for more quickly providing relatively small amounts of ink to the plate cylinder, such as during run-on following cessation of a printing operation. To this end, an additional feeder 17 is provided which preferably is in the form of a quick acting ink unit comprising a dispensing roll 18, transfer rolls 19, 20 and a self-regulating ink feed facility 21. The separate quick acting inking unit is adapted to provide the desired ink-water equilibrium for minimum ink consumption much more rapidly than the main ink feeder so that it is particularly adaptable for proof work or other reduced ink consumption printing.

In keeping with the invention, the quick acting unit 17 is mounted for translational movement between a retracted or inoperative position, shown in solid lines in the drawing, to an in operative position engaging the transfer roll 13, as shown in phantom. Appropriate means, such as diagrammatically indicated at 24, may be provided for effecting such movement. Alternatively, the quick acting inking unit could be mounted for pivotable movement between operative and disengaged positions.

During normal operation of the sheet fed rotary printing press, with the quick acting inking unit in a retracted position, and with the rolls 9 and 6 in respective operative engagement with the transfer rolls 15 and 12, ink is supplied to the plate cylinder from the main inking unit for printing with normal to maximum ink consumption. Upon cessation of a normal printing operation, the transfer roll 9 may be moved to its disengaged position from transfer rolls 15 and 13, as shown in phantom in FIG. 1, and the applicator roll 6 is moved to a disengaged position from transfer roll 12, so as to interrupt the flow of ink from the main inking unit 1, 2 to the plate cylinder 3. At the same time, the quick acting inking unit 17 is moved into operative engagement with

the transfer roll 13, so as to rapidly supply minimum quantities of ink to the plate cylinder for proof work, or reduced ink consumption printing. To resume normal printing, the rolls 9 and 6 again are moved into operative engagement with the main ink transfer line and the quick acting inking unit moved to its retracted position. However, when the printing operation requires substantially no ink, the change over to the main inking unit operation need not be required and only the short inking unit may be used. To prevent disturbances of the equilibrium state or of the ink layer thickness gradient of the transfer rolls 8–15 in response to an interruption of run-off in the main inking unit operation, the change over to the short inking unit operation can be coupled by known control means to the cessation of printing.

I claim:

1. A sheet-fed rotary press comprising

main ink feed means,

a plate cylinder,

a plurality of transfer and applicator rolls coupled between said main ink feed means and said plate cylinder for defining an ink flow path for transferring ink in a downstream direction from said main ink feed means to said plate cylinder during printing operations, means mounting at least one of said transfer rolls which define said flow path for movement between an operative position in said flow path and an inoperative position out of engagement with said transfer and applicator rolls downstream thereof, means for selectively moving said at least one transfer roll from said operative position to said inoperative position for interrupting the transfer of ink from said main ink feed means to said plate cylinder and for isolating a short length roll group comprising only a portion of said plurality of transfer and applicator rolls, and

additional ink feed means, and means for selectively moving said additional ink feed means from an inoperative position out of engagement with said short length roll group to an operative position engaging said short length roll group for supplying ink to said plate cylinder through a shortened flow path via said short length roll group.

2. The rotary printing press of claim 1 in which the transfer and applicator rolls of said short length group remain engaged with each other at all times.

3. The rotary printing press of claim 1 in which said transfer and applicator rolls include a plurality of applicator rolls, means mounting at least one of said applicator rolls for movement between an operative position in said ink flow path to an inoperative position out of engagement with other transfer and applicator rolls of said flow path, and means for simultaneously moving said at least one transfer roll and said at least one applicator roll from said operative to said inoperative positions for interrupting the supply of ink from said main ink feed means to said short length roll group.

4. The rotary printing press of claim 1 in which said additional ink feed means is operable for supplying lesser quantities of ink than said main ink feed means.

5. The rotary printing press of claim 4 in which said additional ink feed means is mounted for translational movement relative to said short length roll group.

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(19) BUNDESREPUBLIK DEUTSCHLAND

DEUTSCHES PATENTAMT

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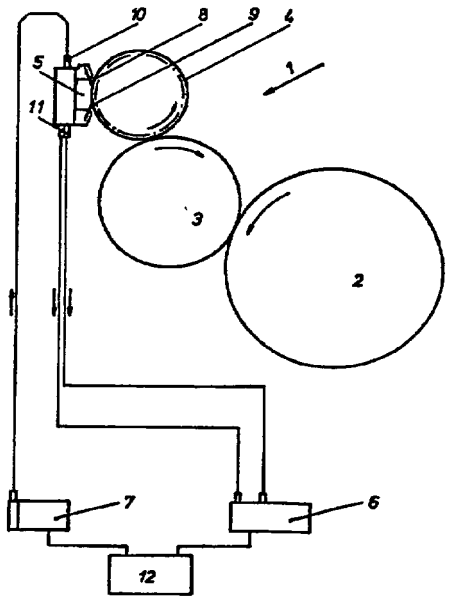
Prüfungsantrag gem. § 44 PatG ist gestellt

(54) Einrichtung zum Beschichten von Bedruckstoffen in Druckmaschinen

(57) Die Erfindung betrifft eine Einrichtung zum Beschichten von Bedruckstoffen in Druckmaschinen zum Auftragen höherviskoser Flüssigkeiten auf Wasserbasis. Aufgabe der Erfindung ist es, eine dementsprechende Einrichtung für Druckmaschinen zu entwickeln, die eine Inlineverarbeitung von höherviskosen Flüssigkeiten mit einer Viskosität von etwa 0,1 bis 2 Pa s gestattet. Gelöst wird die Aufgabe dadurch, daß einem eine Hochdruckform tragenden Formzylinder (3) ein Druckzylinder (2) zugeordnet ist, eine Auftragwalze (4) mit Rasterstruktur dem Formzylinder (3) zugeordnet ist und gleichzeitig der Auftragwalze (4) ein Kammerrakel (5) zugeordnet ist. Das Kammerrakel (5) besteht aus einem positiven Rakel (8) und einem negativen Rakel (9) sowie Seitenteilen. Über eine Förderpumpe (7) wird höherviskose Flüssigkeit dem Kammerrakel (5) zugeführt, in dem Innenraum des Kammerrakels (5) wird ein Überdruck aufgebaut, die höherviskose Flüssigkeit fließt über Flüssigkeitsabläufe (11) ab und wird einer Saugpumpe (6) mit Reservoir (12) zugeführt.



Die folgenden Angaben sind den vom Anmelder eingereichten Unterlagen entnommen

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DE 43 11 834 A1

Beschreibung

Die Erfindung betrifft eine Einrichtung zum Beschichten von Bedruckstoffen in Druckmaschinen, speziell zum Auftragen von höherviskosen, wasserverdünnbaren, als effekt- und/oder schutzlackwirkenden Schichten definierter Dicke auf den Bedruckstoff.

Aus der DE 30 46 257 C2 ist eine Einrichtung mit einem Lackvorratsbehälter und einer Schöpfwalze bekannt. Der durch die Schöpfwalze aufgenommene Lack wird dosiert einer Auftragwalze zugeführt. Zwei Rakelwalzen sind an die Schöpfwalze anstellbar und an die Dosierwalze ist ein Rakelblatt zum Abstreifen der Lackmenge anstellbar.

Ein Auftragswerk für hochviskose, ölhaltige oder niedrigviskose wasserlösliche Schichten ist aus der DE 39 06 648 A1 bekannt. Dieses Auftragswerk ist als Lackiereinrichtung, wahlweise als Offset-Hochdruck- oder Tiefdruckwerk ausgebildet. Die Ausführungen gehen von einer strukturierten Schöpfwalze aus, die mit einem Rakelblatt korrespondierend bzw. von einer Auftragwalze und einem strukturierten Formzylinder, der mit einem Rakelblatt korrespondiert. Das Hochdruckwerk besteht dabei aus einer mit Näpfchen profilierten Schöpfwalze, der ein Rakelblatt zugeordnet ist, einer Übertragwalze, der Glättwalzen zugeordnet sind und einem Formzylinder mit Hochdruckform.

Gemäß der DE 34 27 898 C1 ist eine Vorrichtung zum Dosieren von Lack über einen zwischen zwei Walzen gebildeten Lackspalt bekannt.

Nachteilig bei diesen Lösungen ist es, daß bei Verarbeitung von Flüssigkeiten mit höherer Viskosität, ca. 0,1 bis 2 Pa·s Probleme auftreten, da die Flüssigkeiten eine Fließgrenze aufweisen. Es kommt zu Störungen der Flüssigkeitsströmungen, die z. B. zu sogenannten Lacknestern führen, in denen der Lack leicht antrocknet.

Beispielsweise aus der DE 36 14 582 A1 ist ein sogenanntes Kammerrakel zum Auftragen einer Beschichtungsmasse auf eine Beschichtungswalze bekannt. Mindestens zwei, an einer Walze anliegende, Rakelblätter bilden eine Kammer zur Aufnahme einer Masse, die unter Druck zugeführt wird.

Nachteilig ist, daß die unter Druck zugeführte Masse lediglich über dem Rakelspalt austreten kann und über einen weiteren druckfreien Raum eine Rückführung des Überschusses erfolgt. Bei Verwendung von höherviskosen Flüssigkeiten können sich an den Rakelblättern Ablagerungen aufbauen, die zu Druckstörungen führen.

Aufgabe der Erfindung ist es, eine Beschichtungseinrichtung für Druckmaschinen zu entwickeln, die eine problemlose Inline-Verarbeitung von schnellverdunstenden Flüssigkeiten mit einer Viskosität von etwa 0,1 bis 2 Pa·s und speziellen Zusammensetzungen mit hohem Pigmentanteil bzw. groben Pigmenten gestattet.

Gelöst wird die Aufgabe durch den kennzeichnenden Teil des Hauptanspruches. Weiterbildungen ergeben sich aus den Unteransprüchen.

Die erfindungsgemäße Lösung gestattet es, das Inline-Beschichten mit höherviskosen Flüssigkeiten in einer Druckmaschine vorzunehmen unter besonderer Berücksichtigung von Lacken bzw. pigmentierten Farben auf Wasserbasis (Metallglanzdrucke). Einsatzgebiete bestehen für ausgespartes Lackieren (Spotlackierung) oder vollflächiges Lackieren. Aufgrund der geschlossenen Kammer beim Kammerrakel wird die Verdunstung der verwendeten Flüssigkeit reduziert. Dadurch wird die Verarbeitung von schnell verdunstenden, z. B. wasserlöslichen Flüssigkeiten verbessert. Die Kammerrakel verhindert weiterhin das von offenen Rakelblattausführungen bzw. Schöpfwalzenausführungen bekannte Lack- bzw. Farbspritzen. Ebenso wird das mögliche Aufbauen von angetrockneten Lack-/Farbresten an der Rakelschneide verhindert. Durch das geschlossene Flüssigkeitstransportsystem stellt die erfindungsgemäße Einrichtung einen Funktionsbaustein dar. Neben Kombinationen von mindestens einem Offsetdruckwerk und mindestens einem Flexodruckwerk kann diesen Einrichtungen eine weitere Lackiereinrichtung, z. B. zum vollflächigen Lackieren, nachgeordnet sein.

Die Erfindung soll an einem Ausführungsbeispiel näher erläutert werden. Dabei zeigt

Fig. 1 die schematische Darstellung einer Einrichtung zum Beschichten.

Die in Reihenbauweise ausgeführte Druckmaschine besteht aus fünf Offsetdruckwerken, einer Beschichtungseinrichtung 1 und einer nachgeordneten herkömmlichen Lackiereinheit. Dabei kann die Beschichtungseinrichtung 1 als Spotlackiereinrichtung (für ausgespartes Lackieren) und die nachgeordnete Lackiereinheit zum vollflächigen Oberflächenfinishing eingesetzt werden.

Die erfindungsgemäße Beschichtungseinrichtung 1 besteht aus einem Druckzylinder 2, dem bogenführende Zylinder (nicht gezeigt) vor- bzw. nachgeordnet sind. Der Druckzylinder 2 ist in Kontakt mit einem Formzylinder 3, der eine eingespannte flexible Hochdruckplatte trägt. In Kontakt mit dem Formzylinder 3 ist eine, als Lackwalze wirkende Auftragwalze 4, die eine strukturierte Oberfläche mit Rasternäpfchen besitzt. An die Auftragwalze 4 anstellbar ist dieser ein Kammerrakel 5 zugeordnet, welches ein positives Rakel 8 und ein negatives Rakel 9 und abschließende Seitenteile besitzt, so daß zur Auftragwalze 4 eine offene Kammer gebildet wird. Das positive Rakel 8 zeigt in Drehrichtung der Auftragwalze 4 und wirkt als Schließrakel. Das negative Rakel 9 zeigt entgegen der Drehrichtung der Auftragwalze 4 und wirkt als Arbeitsrakel. Das Kammerrakel 5 besitzt an seinem Gehäuse einen oberhalb einspeisenden Flüssigkeitszulauf 10, der mittig angeordnet ist. Am Gehäuseunterteil des Kammerrakels 5 sind zwei austretende Flüssigkeitsabläufe 11 im Bereich der Seitenteile angeordnet. Der Flüssigkeitszulauf 10 ist mit einer Förderpumpe 7 und einer Leitung gekoppelt. Die Flüssigkeitsabläufe 11 führen über Leitungen zu einer Saugpumpe 6. Eine speziell durch die Pigmentierung höherviskose Flüssigkeit z. B. auf Wasserbasis, wie z. B. Gold- und Silberdruckfarbe, Deckweiß oder Lack, wird durch die Förderpumpe 7 über eine Leitung und den Flüssigkeitszulauf 10 in die Gehäusekammer der Kammerrakel 4 gefördert. Der Förderdruck der Pumpe 7 bildet im Inneren des Kammerrakels 5 einen Überdruck aus, aufgrund dessen die höherviskose Flüssigkeit das Innere des Kammerrakels 5 in Richtung Auftragwalze und durch die Flüssigkeitsabläufe 11 verlassen soll. Von den Abläufen 11 wird die Flüssigkeit durch die Saugpumpe 6 in ein Reservoir 12 zurückgefördert. Über die Rasternäpfchen der Auftragwalze 4 wird die höherviskose Flüssigkeit von der als Lackwalze wirkenden Auftragwalze 4 zum Einfärben der Hochdruckform auf den Formzylinder 3 transportiert und wird als Schicht auf den vom Druckzylinder 2 zugeführten Bedruckstoff aufgebracht. Während des von der Auftragwalze 4 bewirkten Flüssigkeitstransports rakelt das negative Rakel 9 die Flüssigkeit von den Stegen der Rasternäpfchenstruktur der Auftragwalze 4 ab, so daß die Flüssigkeit ausschließlich in den Rasternäpfchen verbleibt.

Bezugszeichenliste

1 Einrichtung
2 Druckzylinder
3 Formzylinder
4 Auftragwalze
5 Kammerrakel
6 Saugpumpe
7 Förderpumpe
8 positives Rakel
9 negatives Rakel
10 Flüssigkeitszulauf
11 Flüssigkeitsablauf
12 Reservoir

Patentansprüche

1. Einrichtung vorzugsweise in Bogenrotationsdruckmaschinen für mehrfarbigen Offsetdruck zum Beschichten von Bedruckstoffen mit wenigstens einem Lackierwerk, **dadurch gekennzeichnet**, daß wenigstens ein Beschichtungswerk als Flexodruckwerk ausgebildet ist.
2. Einrichtung nach Anspruch 1, dadurch gekennzeichnet, daß dem Flexodruckwerk ein konventionelles Lackierwerk direkt oder indirekt nachgeordnet ist.
3. Einrichtung nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß im Flexodruckwerk als Rakeleinrichtung ein Kammerrakel vorgesehen ist.
4. Einrichtung nach Anspruch 1 und 2, dadurch gekennzeichnet, daß das Flexodruckwerk aus folgenden Elementen besteht:
einem, eine Hochdruckform tragenden Formzylinder (3), der mit einem Druckzylinder (2) in Kontakt steht,
einer Auftragwalze (4) mit Rasterstruktur, die mit dem Formzylinder (3) in Kontakt steht und
einem Kammerrakel (5), dessen positives Rakel (8) in Drehrichtung der Auftragwalze (4) an diese angestellt ist und dessen negatives Rakel (9) entgegen der Drehrichtung der Auftragwalze (4) an diese angestellt ist, wobei eine Förderpumpe (7) Leitungssystemen mit Reservoir (12) vorgeordnet und eine Saugpumpe (6) Leitungssystemen mit Reservoir (12) dem Kammerrakel (5) nachgeordnet sind.
5. Einrichtung nach Anspruch 1, dadurch gekennzeichnet, daß das Kammerrakel (5) mit Leitungssystem, Förderpumpe (7) und Saugpumpe (6) ein geschlossenes System bilden, in dem zwischen Förderpumpe (7) und Saugpumpe (6) ein gemeinsames Reservoir (12) angeordnet ist.
6. Einrichtung nach Anspruch 1 und 2, dadurch gekennzeichnet, daß die Einrichtung (1) als Funktionsbaustein in einer Offsetdruckmaschine den Offsetdruckwerken vorgeordnet ist.
7. Einrichtung nach Anspruch 1 und 2, dadurch gekennzeichnet, daß die Einrichtung (1) als Funktionsbaustein in einer Offsetdruckmaschine zwischen den Offsetdruckwerken angeordnet ist.
8. Einrichtung nach Anspruch 1 und 2, dadurch gekennzeichnet, daß die Einrichtung (1) als Funktionsbaustein in einer Offsetdruckmaschine den Offsetdruckwerken nachgeordnet ist.

Hierzu 1 Seite(n) Zeichnungen

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Int. Cl.[5]: B 41 F 23/08
Offenlegungstag: 13. Oktober 1994

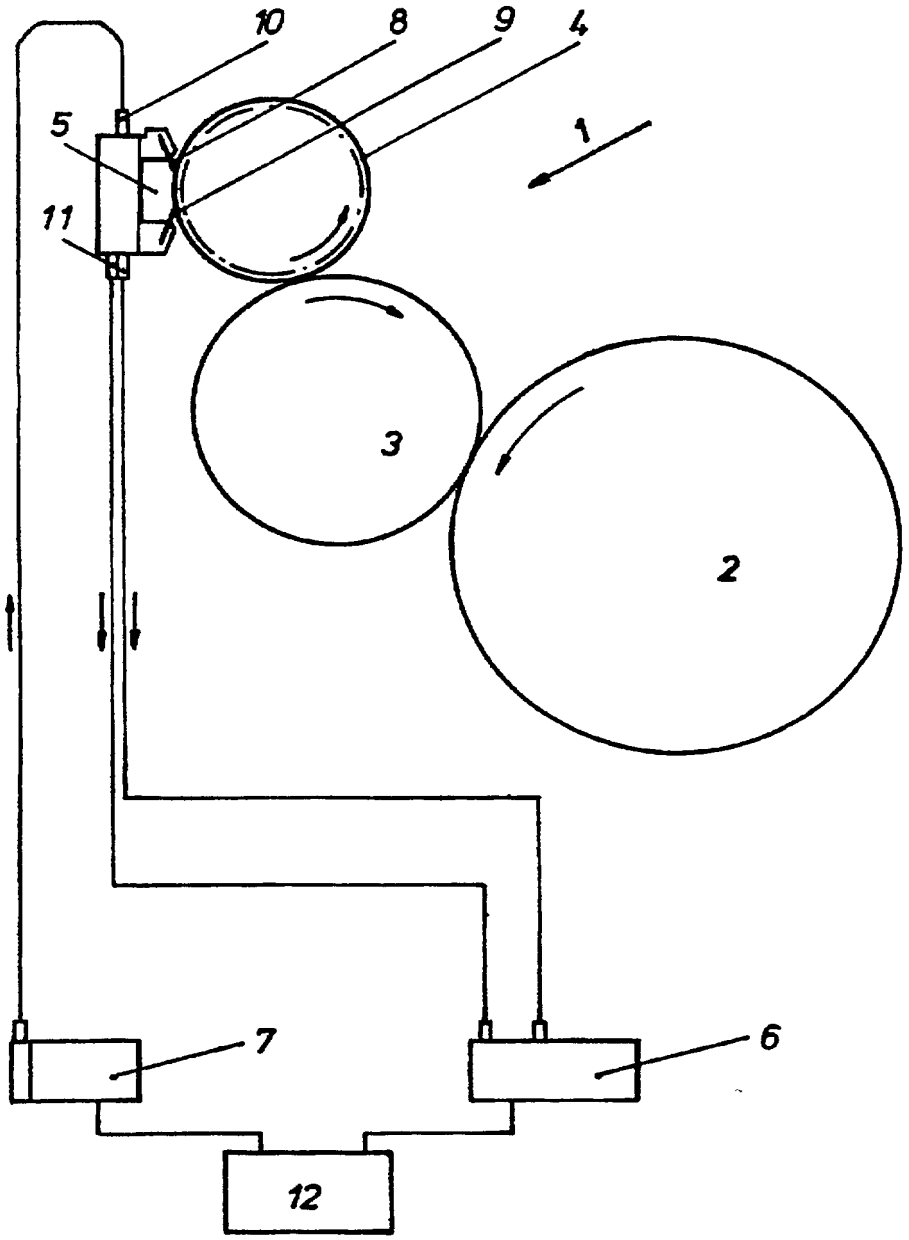

FIG.1

65

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B41F 31/06

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B6C CEBE C104 C511 C514 C520

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(54) Printing apparatus

(57) A divider seal 10 for a split-fountain chambered doctor blade for a printing press, comprising a seal contoured to sealingly engage a circumferential surface of a rotating cylinder, a seal retainer for retaining the seal in sealing engagement with the rotating cylinder, and pneumatic biasing structure, such as a pneumatic bladder, acting on the seal retainer for resiliently biasing the seal into sealing engagement with the rotating cylinder. The seal is located axially between the ends of the ink fountain 12 to allow different coloured inks to be used. A recess 38 is fed with water via channels 40, 42. Components of the seal may be of high molecular weight foam material aluminium or moulded plastics.

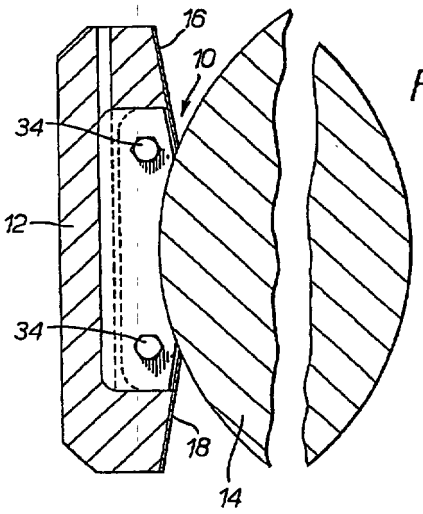

Fig. 1.

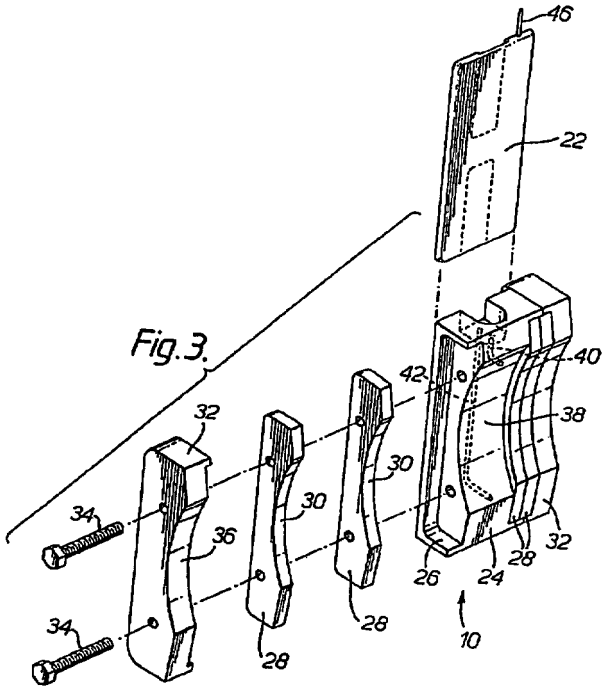

Fig. 3.

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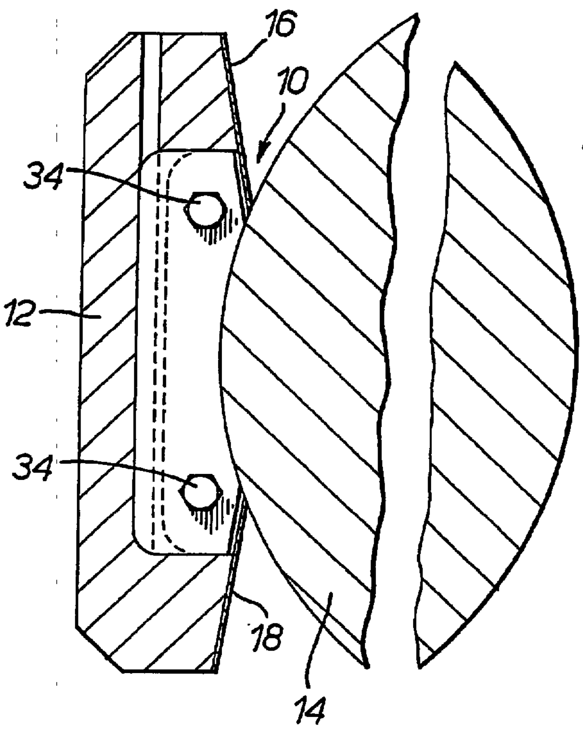


Fig. 1.

Fig. 2.

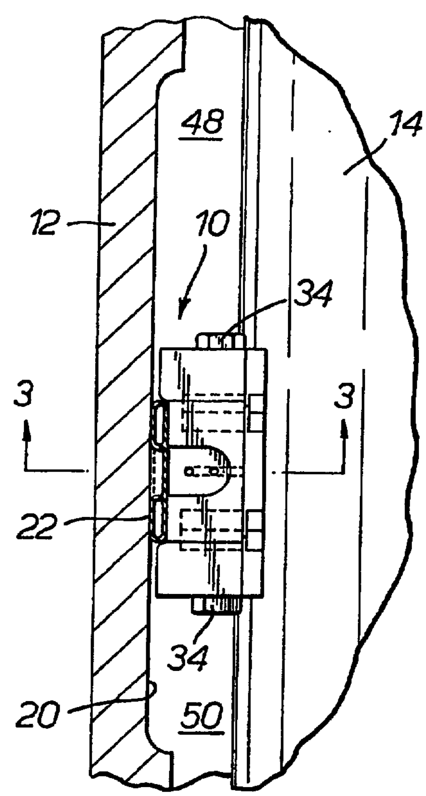


Fig.4.

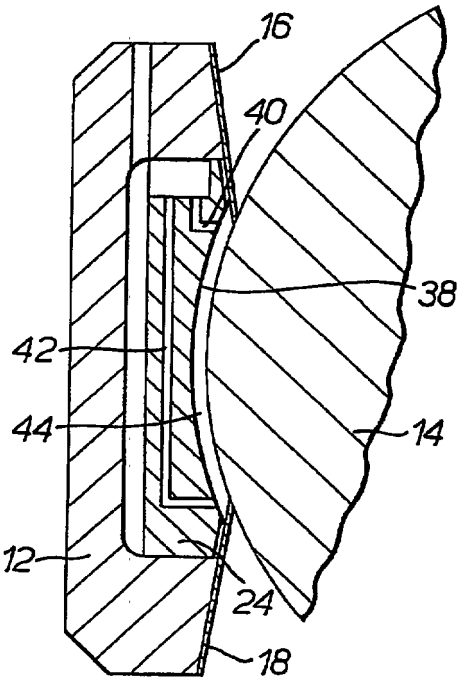
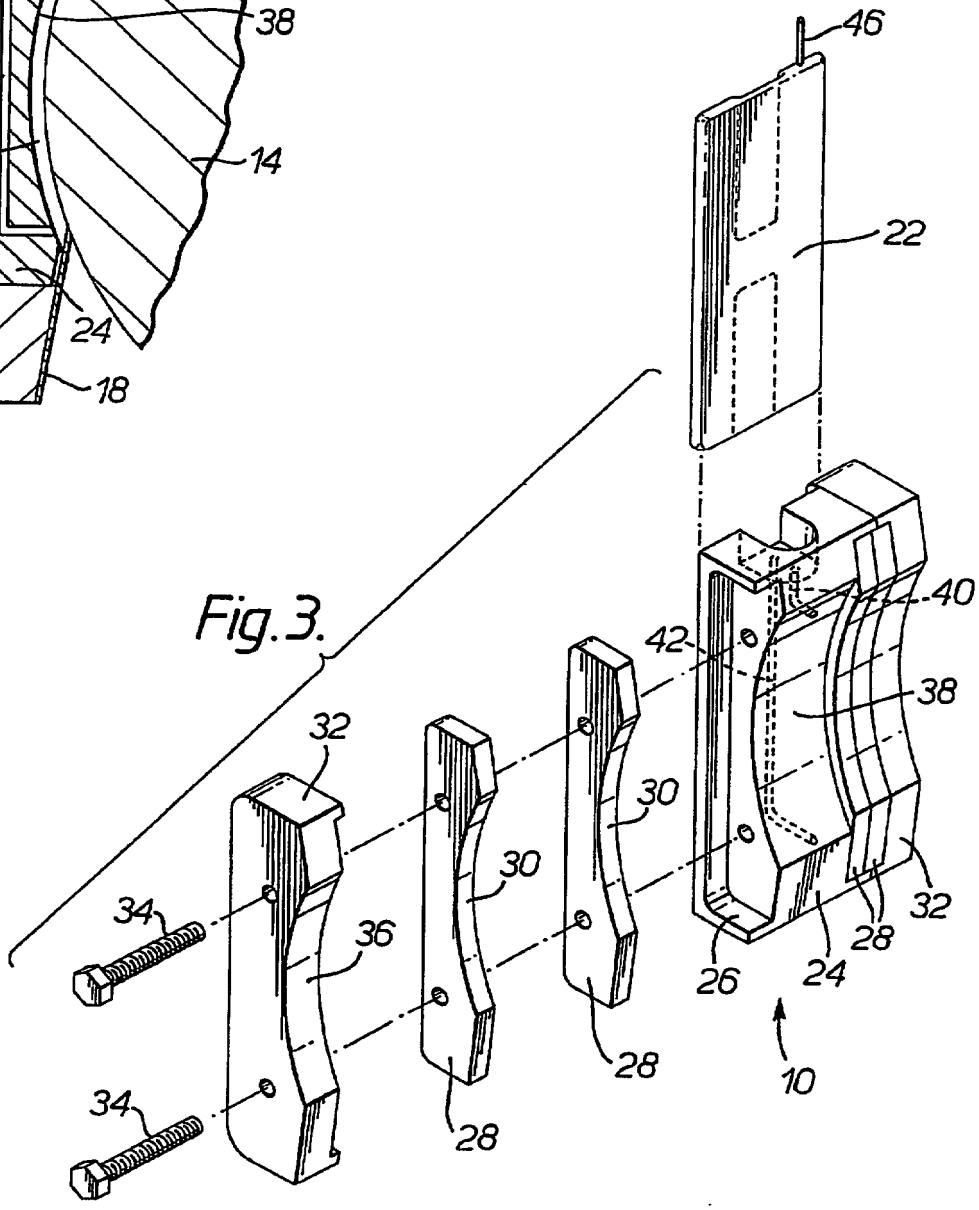


Fig.3.



Printing Apparatus

The present invention relates particularly to flexographic printing presses which utilise a chambered doctor blade ink fountain, and is more particularly concerned with split-fountain chambered doctor blades which permit simultaneous printing with two or more different colour inks, where the seal of the present invention may be used to divide the chambered doctor blade into two or more chambers.

Flexographic printing is a rotary letter press printing process which traditionally uses flexible rubber, or other elastomer, printing plates and liquid, fast drying ink. An advantage of flexographic printing is its simple ink distribution system.

In flexographic printing, a web to be imprinted is passed between an impression cylinder and a plate cylinder, from which the ink is transferred to the web. Ink is applied to the plate cylinder in precisely-controlled quantities by an anilox (R.T.M.) metering roll. The circumferential surface of the anilox roll is divided into a very large number of small cells (typically, 15,000 cell per square centimetre). The surface of the anilox roll is flooded with ink, thus filling the cells on the roll's surface. Ink is fed to the anilox roll by an ink fountain. A commonly-used ink fountain comprises an ink reservoir and a pair of doctor blades which contact the anilox roll above and below the reservoir. The surface of the anilox roll, the doctor blades and the reservoir define a closed chamber for containing the ink. As the anilox roll rotates, the doctor blades shave the surplus ink from the surface of the anilox roll so that ink is carried only in the interior of the cells on the roll's surface and not on the lands between cells. This results in a uniformly metered film of ink being applied to the surface of the plate cylinder.

Typically, the ink fountain extends the entire length of the anilox roll and plate cylinder. In cases where it is desired to print more than one colour on a web, which requires more than one colour of ink, the chamber containing the ink in the ink fountain is divided into two or more subchambers or compartments by ink dams or dividers. These dividers are designed to maintain a fluid-tight seal between compartments in the ink fountain and to maintain a seal against the anilox roll.

Ink fountain dividers per se are known in the art, and are illustrated in, for example, U.S. patents 3,381,517, 4,559,871, 4,667,595,

and 4,796,528.

These prior arrangements are mechanically very complex. They are thus expensive to fabricate, require careful and precise alignment, and are susceptible to misalignment in use. There is therefore a need for a simple, inexpensive divider seal which is easy to fabricate and install, requires no time-consuming alignment, can compensate for wear and misalignment, and still provides an effective divider seal. The present invention fulfils that need.

The present invention is a divider seal for a split-fountain chambered doctor blade for a printing press, comprising seal means contoured to sealingly engage a circumferential surface of a rotating cylinder, retaining means for retaining the seal means in sealing engagement with the rotating cylinder, and pneumatic biasing means acting on the retaining means for resiliently biasing the seal means into sealing engagement with the rotating cylinder.

The pneumatic biasing means offers a high degree of compliance and allows for variations in wear and alignment in use.

An example of apparatus according to this invention is shown in the accompanying drawings in which:

Figure 1 is a side elevational view, partially in section, of an ink fountain and an anilox roll, of which the ink fountain is equipped with the divider seal according to the present invention.

Figure 2 is a top plan view, partially broken away, of the divider seal and anilox roll shown in Figure 1.

Figure 3 is an exploded view of the divider seal according to the present invention.

Figure 4 is a sectional view, partially broken away, taken along the lines 3-3 of Figure 2.

Referring now to the drawings, wherein like numerals indicate like elements, there is shown in Figure 1 a divider seal 10 according to the present invention mounted in a chambered doctor blade ink fountain 12, in sealing engagement with an anilox roll 14. Anilox roll 14 has already been described and is known in the art, and need not be described in further detail, except to note that, as previously described, anilox roll 14 rotates on its axis relative to ink fountain 12. Also, ink fountain 12 has already been described and is known in the art, and will be described only with the degree of detail necessary to understand the present invention. In that regard, ink fountain 12 comprises upper and lower

doctor blades 16 and 18 which contact the surface of the anilox roll and meter the amount of ink supplied to the anilox roll by ink fountain 12. Doctor blades 16 and 18 are conventional and known in the art.

As seen in Figure 1, divider seal 10 has a sealing surface which is contoured to and contacts the surface of anilox roll 14 which extends into ink fountain 12 between doctor blades 16 and 18. Divider seal 10 is otherwise dimensioned to fit within the chamber of chambered doctor blade ink fountain 12, which is of uniform cross-section.

Figure 2 illustrates the divider seal 10 as seen from above, with ink fountain 12 partially in section to permit divider seal 10 to be clearly seen. As best seen in Figure 2, divider seal 10 is spaced a short distance from the rear wall 20 of ink fountain 12. Between the rear wall of ink fountain 12 and divider seal 10 is a biasing means in the form of a pneumatic bladder 22. Pneumatic bladder 22 may be pressurised and depressurised to apply more or less biasing force to divider seal 10, thereby controlling the loading force of divider seal 10 against anilox roll 14.

Referring now to Figure 3, the various parts of divider seal 10 are shown in an exploded view. Divider seal 10 comprises a manifold 24, which includes lateral recesses on either side. Recess 26 is visible in Figure 3. Recess 26 receives at least one, and preferably two, seal members 28. Seal members 28 are preferably made of an ultrahigh molecular weight closed foam material, and each seal means has a contoured surface 30 contoured to the curvature of anilox roll 14 so as to intimately engage the surface of anilox roll 14 when the seal means 28 are brought into contact with the surface of anilox roll 14. Seal means 28 and end cap 32 may be retained on manifold 24 by any suitable means, such as threaded fasteners 34. End cap seal 32 also has a contoured surface 36, which has substantially the same contour as contoured surface 30 of seal means 28.

Manifold 24 is substantially symmetrical along its longitudinal axis, and therefore receives a pair of seal means 28 and an end cap seal 32 on both sides.

Manifold 24 may be made of any suitable material. For example, manifold 24 may, for example, be machined from aluminium, or moulded in plastic. A preferred material for manifold 24 is aluminium with a Teflon (Registered Trade Mark) coating. End cap seals 32 are preferably moulded from an ultrahigh molecular weight plastic.

It will be seen in Figure 3 that, as with seal means 28 and end cap seals 32, manifold 24 has a contoured surface 38. However, contoured surface 28 is contoured to a curvature having a radius slightly greater than the curvature of contoured surfaces 30 and 36 of seal means 28 and end cap seals 32. This provides a small gap between anilox roll 14 and contoured surface 38, as best seen in Figure 3.

Referring now to Figure 4, manifold 24 is shown in section. Manifold 24 includes a pair of liquid flow channels 40 and 42. (Channels 40 and 42 are shown in phantom in figure 3.) These channels serve to supply and drain water to the gap 44 between contoured surface 38 and anilox roll 14. Gap 44 forms a water reservoir defined by contoured surface 38, anilox roll 14 and top and bottom doctor blades 16 and 18. Water is preferably supplied to reservoir 44 through flow channel 40 and drained, preferably by vacuum, through channel 42. The water in reservoir 44 fills the interstices in seal means 28, so that there is a film of water between seal means 29 and the surface of anilox roll 14. The film of water serves as both a low-friction bearing and a fluid seal.

Seal means 28 are biased into sealing engagement with anilox roll 14 by the pneumatic bladder 22. Bladder 22 is positioned between manifold 24 and the rear wall 20 of ink fountain 12, as previously described. Air is supplied to and exhausted from bladder 22 through an air supply conduit 46. By pressurising bladder 22, seal means 28 are biased into sealing engagement with the surface of anilox roll 14. The biasing force can be controlled by controlling the internal pressure of bladder 22. Since bladder 22 is pneumatically pressurised, bladder 22 is resilient. That is, bladder 22 permits divider seal 10 to move toward and away from rear wall 20 as anilox roll 14 rotates, to compensate for variations in the surface of anilox roll 14, such as a slightly out-of-round condition or slight misadjustment, for example where the ink fountain 12 is not exactly parallel to the axis of anilox roll 14. In addition, bladder 22 enables divider seal 10 to move toward anilox roll 14 to compensate for wear of both the surface of anilox roll 14 and the contoured surfaces 30 of the seal members 28, as a result of normal use. Since air is a compressible fluid, bladder 2 can be pressurised to a degree that will enable divider seal 10 to move toward and away from rear wall 20 of ink fountain 12, as may be required by out-of-round conditions in anilox roll 14, misalignments, and wear.

It will be appreciated that ink fountain 12 can be divided into two

or more compartments (see Figure 2) by using one or more divider seals 10. Thus, ink fountain 12 may be divided into two compartments 48 and 50 by using a single divider seal 10. If two divider seals are used, ink fountain 12 can be divided into three compartments, and so on, so that any number of compartments as desired may be provided.

It will also be noted that neither bladder 22 nor divider seal 10 are fixedly attached to rear wall 20 of ink fountain 12. Thus, divider seal 10 can be placed at any desired location along anilox roll 14, so that the lateral extent of the compartments 48 and 50 can be infinitely variable. Thus, the invention permits not only any desired number of compartments to be formed in ink fountain 12, but enables the lateral extent of the compartments so formed to be infinitely varied as desired. Hence, the present invention makes it very simple to reconfigure ink fountain 12 for different colours and dimensions. This reduces set-up time between printing runs, thereby reducing press down time and increasing equipment utilisation and throughput.

Claims

1. A divider seal for a split-fountain chambered doctor blade for a printing apparatus, comprising

a. seal means contoured to sealingly engage a circumferential surface of a rotating cylinder,

b. movable retaining means for retaining the seal means in sealing engagement with the rotating cylinder,

c. pneumatic biasing means movable with the retaining means and acting on the retaining means for resiliently biasing the seal means into sealing engagement with the rotating cylinder.

2. A divider seal according to claim 1, wherein the pneumatic biasing means comprises a pneumatic bladder.

3. A divider seal according to claim 2, further comprising means for selectably increasing and decreasing the pneumatic pressure in the bladder.

4. A divider seal according to claim 2, wherein the seal means comprises an ultra-high molecular weight closed foam.

5. A divider seal according to claim 1, further comprising a gap between the retaining means and the circumferential surface of the rotating cylinder, and means for supplying a liquid to said gap to form a liquid interface between said retaining means and circumferential surface.

6. A flexographic printing apparatus having an anilox roll and a chambered doctor blade ink fountain adjacent the anilox roller for applying printing ink thereto, a movable divider seal for dividing the doctor blade chamber into at least two compartments, the compartments containing different colour inks therein, said divider seal comprising a seal member contoured to and in sealing engagement with the outer circumferential surface of the anilox roller, a seal retainer for retaining the seal member in engagement with the circumferential surface of the anilox roller, and an inflatable and deflatable pneumatic bladder mounted between the back surface of the seal retainer and an

opposed wall of the doctor blade assembly for applying a biasing force to the seal retainer and the seal member for resiliently biasing the seal member into engagement with the circumferential surface of the anilox roller.

7. A divider seal according to claim 6, wherein said pneumatic bladder is positioned between the seal retainer and a rear wall of the ink fountain.

8. A divider seal according to claim 7, wherein the divider seal is infinitely positionable along the length of the anilox roll between the anilox roll and said rear wall of the ink fountain.

9. Printing apparatus comprising an ink fountain mounted adjacent to a roll adapted to receive a film of ink from the fountain, the fountain comprising means defining an ink chamber extending parallel to the axis of the roll, at least a portion of the chamber being of uniform cross-section and containing chamber divider which is selectively positionable at various positions in the uniformly sectioned part of the chamber and includes at least one sealing portion having a concave surface adjacent to and conforming with the surface of the roll, and including a bladder positioned between a back surface of the divider and an opposed wall of the chamber and adapted to seal the gap between the said back surface and the chamber wall and, when pressurised, to bias the concave seal surface of the divider resiliently into sealing engagement with the roll.

10. Printing apparatus according to claim 9, in which the said back surface of the divider and the said opposed chamber wall are both substantially flat and are both substantially parallel to a tangent to the roll at approximately a mid-point along the said concave surface of the sealing portion, whereby expansion of the bladder produces a series of biasing forces on the divider which are substantially parallel to a radius of the roll at the said mid-point.

11. Printing apparatus according to claim 9 or claim 10, in which the chamber divider includes a second sealing portion spaced from and similar to the first-mentioned sealing portion, the surface of the

divider between the sealing portions being recessed to define a semi-annular chamber adjacent to the roll, and including means for delivering liquid into the semi-annular chamber to form an additional barrier, supplementing the sealing effects of the seal portions, between inks contained during use in the portions of the ink chamber on opposite sides of the divider.

12. Apparatus according to any one of claims 1 to 11 and substantially as described with reference to the accompanying drawings.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number
GB 9301101.3

Relevant Technical fields

(i) UK Cl (Edition L) B6C CEBB, CEBE, CEBX

(ii) Int Cl (Edition 5) B41F

Search Examiner
A DARCY

Databases (see over)

(i) UK Patent Office

(ii) ONLINE DATABASE: WPI

Date of Search
26 MARCH 1993

Documents considered relevant following a search in respect of claims 1-12

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB 0924401 A - (TIMSON) see element 5, figure 2	1-3,6,9
X	US 4165688 A - (MAGNA-GRAPHICS) see example figure 2	1-3,6,9

US005243907A

United States Patent [19]

Weishew

[11] Patent Number: 5,243,907

[45] Date of Patent: Sep. 14, 1993

[54] DIVIDER SEAL FOR SPLIT-FOUNTAIN CHAMBERED DOCTOR BLADE FOR A FLEXOGRAPHIC PRINTING PRESS

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[73] Assignee: The Langston Corporation, Cherry Hill, N.J.

[21] Appl. No.: 824,822

[22] Filed: Jan. 22, 1992

[51] Int. Cl.[5] B41F 31/00

[52] U.S. Cl. 101/208; 101/364

[58] Field of Search 101/208, 207, 210, 364, 101/367, 366

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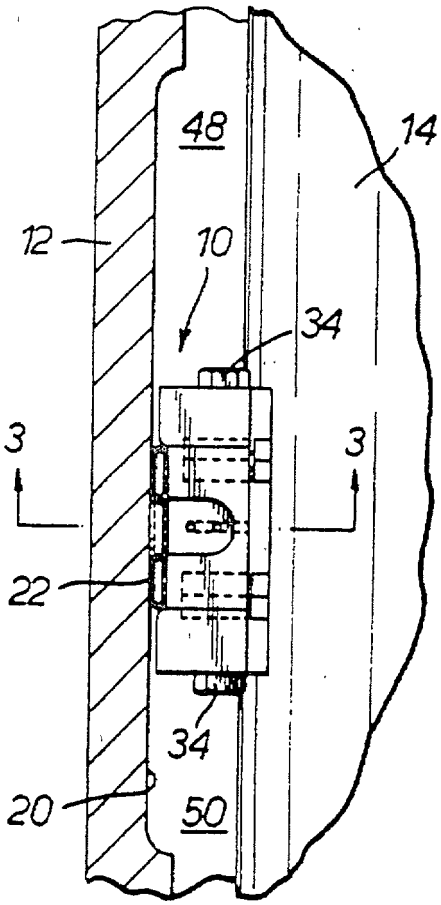
Attorney, Agent, or Firm—Seidel, Gonda, Lavorgna & Monaco

[57] ABSTRACT

A divider seal for a split-fountain chambered doctor blade for a printing press, comprising a seal contoured to sealingly engage a circumferential surface of a rotating cylinder, a seal retainer for retaining the seal in sealing engagement with the rotating cylinder, and pneumatic biasing structure, such as a pneumatic bladder, acting on the seal retainer for resiliently biasing the seal into sealing engagement with the rotating cylinder.

23 Claims, 2 Drawing Sheets



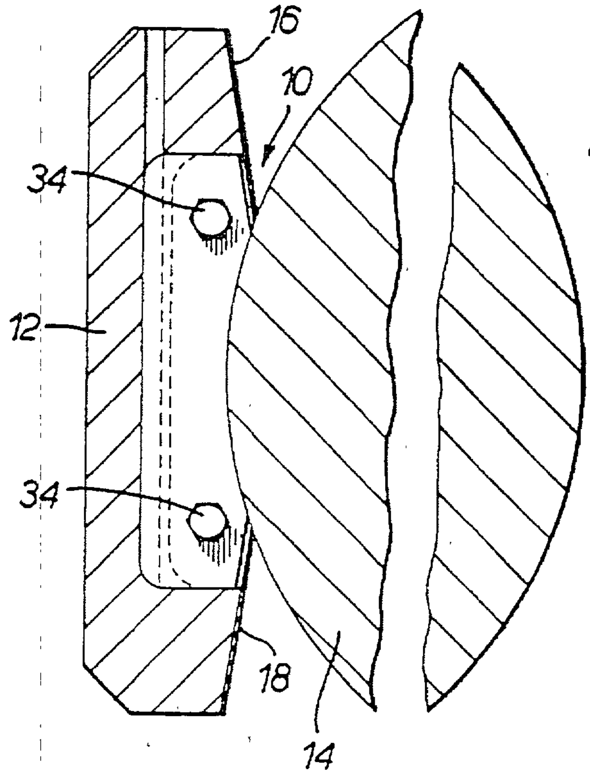
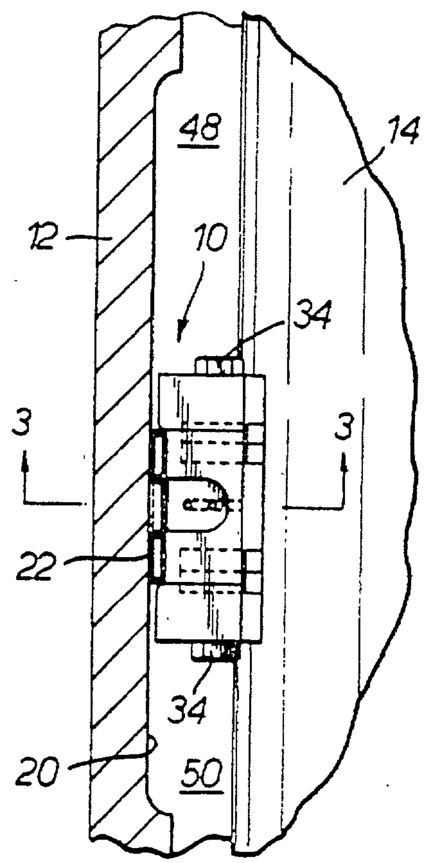


Fig. 1.

Fig. 2.



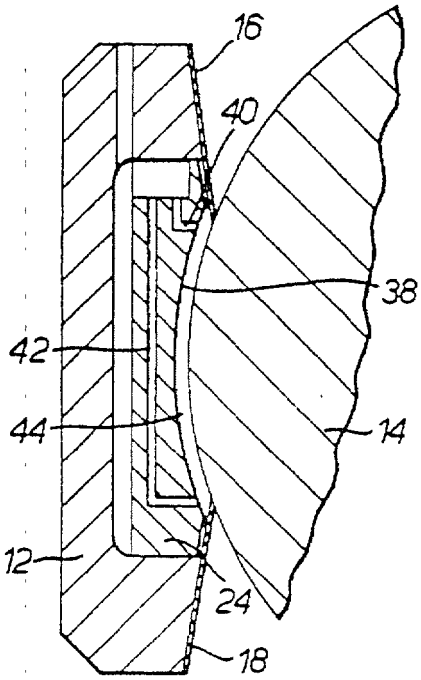

16
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Fig.4.

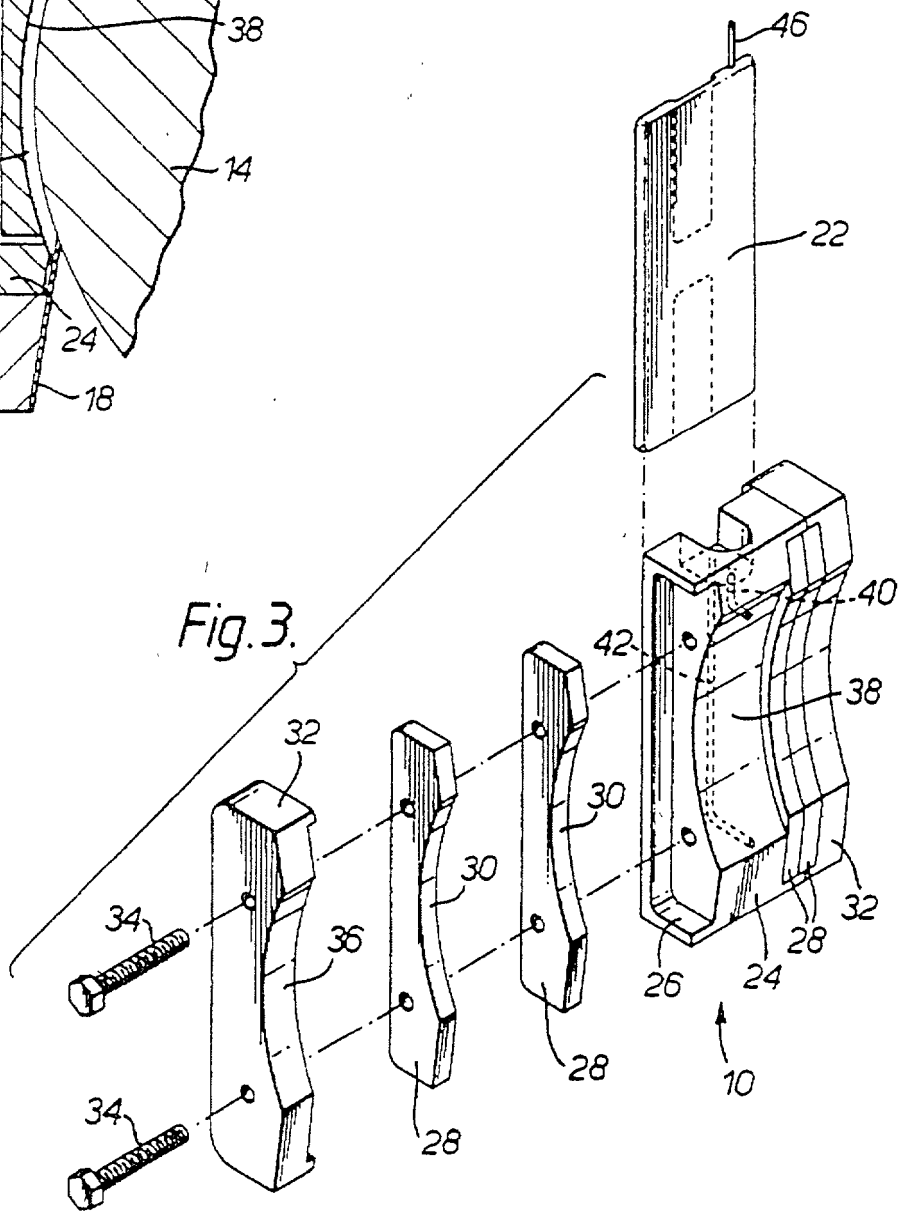
46
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Fig.3.

DIVIDER SEAL FOR SPLIT-FOUNTAIN CHAMBERED DOCTOR BLADE FOR A FLEXOGRAPHIC PRINTING PRESS

FIELD OF THE INVENTION

The present invention relates to flexographic printing presses, in particular flexographic printing presses which utilize a chambered doctor blade ink fountain. The invention finds particular utility in connection with split-fountain chambered doctor blades which permit simultaneous printing with two or more different color inks, where the seal of the present invention may be used to divide the chambered doctor blade into two or more chambers, but the present invention is useful in other contexts where it is desired to effect a seal with respect to a rotating cylinder. Thus, although the invention is described in the context of a flexographic printing press, the invention is not limited to use in such devices.

BACKGROUND OF THE INVENTION

Flexographic printing is a rotary letter press printing process which traditionally uses flexible rubber, or other elastomer, printing plates and liquid, fast drying ink. An advantage of flexographic printing is its simple ink distribution system.

In flexographic printing, a web to be imprinted is passed between an impression cylinder and a plate cylinder, from which the ink is transferred to the web. Ink is applied to the plate cylinder in precisely-controlled quantities by an anilox metering roll. The circumferential surface of the anilox roll is divided into a very large number of small cells (typically, 15,000 cell per square centimeter). The surface of the anilox roll is flooded with ink, thus filling the cells on the roll's surface. Ink is fed to the anilox roll by an ink fountain. A commonly-used ink fountain comprises an ink reservoir and a pair of doctor blades which contact the anilox roll above and below the reservoir. The surface of the anilox roll, the doctor blades and the reservoir define a closed chamber for containing the ink. As the anilox roll rotates, the doctor blades shave surplus ink from the surface of the anilox roll so that ink is carried only in the interior of the cells on the roll's surface and not on the lands between cells. This results in a uniformly metered film of ink being applied to the surface of the plate cylinder.

Typically, the ink fountain extends the entire length of the anilox roll and plate cylinder. In cases where it is desired to print more than one color on a web, which requires more than one color of ink, the chamber containing the ink in the ink fountain is divided into two or more subchambers or compartments by ink dams or dividers. These dividers are designed to maintain a fluid-tight seal between compartments in the ink fountain and to maintain a seal against the anilox roll.

Ink fountain dividers per se are known in the art, and are illustrated in, for example, U.S. Pat. Nos. 3,381,517, 4,559,871, 4,667,595, and 4,796,528.

U.S. Pat. No. 3,831,517 discloses an apparatus for resiliently urging a seal member against a roller in the context of a fountain divider for a printing press ink fountain. The seal member is urged against the roller by a flat flexible spring strap with an arcuate outside surface which engages the sealing member. The biasing force exerted by the spring strap on the seal member can be adjusted by means of an adjusting rod, one end of which engages the spring strap and the other end of which engages a desired serration in a saw-toothed member.

U.S. Pat. No. 4,559,871 discloses divider plates for an ink dividing assembly for an inking roller in an ink fountain of a rotary printing press, with the divider plates resiliently biased against the ink roller. The divider plates are shown in conjunction with a chambered doctor blade assembly. The divider plates are slidingly mounted in guide plates. The front surface of the divider plates is curved and engages an inking roller. The divider plates are spring-biased into contact with the inking roller by leaf springs.

U.S. Pat. No. 4,667,595 discloses divider plates between axially-spaced doctor bars in an inking system for a rotary printing press. The divider plates rotate about a pin whose axis is parallel to the axis of the inking roller so that they are biased against the inking roller by gravity.

U.S. Pat. No. 4,796,528 shows a separator element located within a chambered doctor blade ink fountain to separate the fountain into axial zones. The separator element comprises a separator strip which extends over a portion of the surface of an anilox roller. A thin film of liquid, such as water or an aqueous solution of alcohol, is supplied to the separator strip so that the strip rides on a liquid film between the strip and the anilox roller, thus forming a fluid seal between axial zones in the ink fountain.

It will be appreciated that all of these prior arrangements are mechanically very complex. They are thus expensive to fabricate, require careful and precise alignment, and are susceptible to misalignment in use. There is therefore a need for a simple, inexpensive divider seal which is easy to fabricate and install, requires no time-consuming alignment, can compensate for wear and misalignment, and still provides an effective divider seal. The present invention fulfills that need.

SUMMARY OF THE INVENTION

The present invention is a divider seal for a split-fountain chambered doctor blade for a printing press, comprising seal means contoured to sealingly engage a circumferential surface of a rotating cylinder, retaining means for retaining the seal means in sealing engagement with the rotating cylinder, and pneumatic biasing means acting on the retaining means for resiliently biasing the seal means into sealing engagement with the rotating cylinder.

The pneumatic biasing means offers a high degree of compliance and allows for variations in wear and alignment in use.

DESCRIPTION OF THE DRAWINGS

For the purpose of illustrating the invention, there is shown in the drawings a form which is presently preferred; it being understood, however, that this invention is not limited to the precise arrangements and instrumentalities shown.

FIG. 1 is a side elevational view, partially in section, of an ink fountain and an anilox roll, which the ink fountain being equipped with the divider seal according to the present invention.

FIG. 2 is a top plan view, partially broken away, of the divider seal and anilox roll shown in FIG. 1.

FIG. 3 is an exploded view of the divider seal according to the present invention.

FIG. 4 is a sectional view, partially broken away, taken along the lines 3—3 of FIG. 2.

DESCRIPTION OF THE INVENTION

Referring now to the drawings, wherein like numerals indicate like elements, there is shown in FIG. 1 a divider seal 10 according to the present invention, mounted in a chambered doctor blade ink fountain 12, in sealing engagement with an anilox roll 14. Anilox roll 14 has already been described and is known in the art, and need not be described in further detail, except to note that, as previously described, anilox roll 14 rotates on its axis relative to ink fountain 12. Also, ink fountain 12 has already been described and is known in the art, and will be described only with the degree of detail necessary to understand the present invention. In that regard, ink fountain 12 comprises an upper 16 and a lower 18 doctor blade which contact the surface of the anilox roll and meter the amount of ink supplied to the anilox roll by ink fountain 12. Doctor blades 16 and 18 are conventional and known in the art.

As seen in FIG. 1, divider seal 10 has a sealing surface which is contoured to and contacts the surface of anilox roll 14 which extends into ink fountain 12 between doctor blades 16 and 18. Divider seal 10 is otherwise dimensioned to fit within the chamber of chambered doctor blade ink fountain 12.

FIG. 2 illustrates the divider seal 10 as seen from above, with ink fountain 12 partially in section to permit divider seal 10 to be clearly seen. As best seen in FIG. 2, divider seal 10 is spaced a short distance from the rear wall 20 of ink fountain 12. Between the rear wall of ink fountain 12 and divider seal 10 is a biasing means in the form of a pneumatic bladder 22. Pneumatic bladder 22 may be pressurized and depressurized in conventional fashion to apply more or less biasing force to divider seal 10, thereby controlling the loading force of divider seal 10 against anilox roll 14.

Referring now to FIG. 3, the various parts of divider seal 10 are shown in an exploded view. Divider seal 10 comprises a manifold 24, which includes lateral recesses on either side. Recess 26 is visible in FIG. 3. Recess 26 receives at least one, and preferably two, seal members 28. Seal members 28 are preferably made of an ultrahigh molecular weight closed foam material, and each seal means has a contoured surface 30 contoured to the curvature of anilox roll 14 so as to intimately engage the surface of anilox roll 14 when the seal means 28 are brought into contact with the surface of anilox roll 14. Seal means 28 are retained in place with respect to manifold 24 by an end cap seal 32. Seal means 28 and end cap 32 may be retained on manifold 24 by any suitable means, such as threaded fasteners 34. End cap seal 32 also has a contoured surface 36, which has substantially the same contour as contoured surface 30 of seal means 28.

Manifold 24 is substantially symmetrical along its longitudinal axis, and therefore receives a pair of seal means 28 and an end cap seal 32 on both sides.

Manifold 24 may be made of any suitable material. For example, manifold 24 may be machined from aluminum, or molded in plastic. A preferred, but not necessarily the only, material for manifold 24 is aluminum with a Teflon ® coating. End cap seals 32 are preferably, although not necessarily, molded from an ultrahigh molecular weight plastic. It should be understood, however, that the choice of materials for manifold 24 and end cap seals 32 is not critical to the present invention, and other materials can be used without departing from the scope of the invention. Likewise, although seal means 28 are preferably made from ultrahigh molecular weight closed foam material, other suitable sealing materials may be used without departing from the scope of the invention.

It will be seen in FIG. 3 that, as with seal means 28 and end cap seals 32, manifold 24 has a contoured surface 38. However, contoured surface 38 is contoured to a curvature having a radius slightly greater than the curvature of contoured surfaces 30 and 36 of seal means 28 and end cap seals 32. This provides a small gap between anilox roll 14 and contoured surface 38, as best seen in FIG. 3.

Referring now to FIG. 4, manifold 24 is shown in section. Manifold 24 includes a pair of liquid flow channels 40 and 42. (Channels 40 and 42 are shown in phantom in FIG. 3.) Liquid flow channels 40 and 42 serve to supply and drain water to the gap 44 between contoured surface 38 and anilox roll 14. Gap 44 forms a water reservoir defined by contoured surface 38, anilox roll 14 and top and bottom doctor blades 16 and 18. Water is preferably supplied to reservoir 44 through flow channel 40 and drained, preferably by vacuum, through channel 42. The water in reservoir 44 fills the interstices in seal means 28, so that there is a film of water between seal means 28 and the surface of anilox roll 14. The film of water serves as both a low-friction bearing and a fluid seal.

Seal means 28 are biased into sealing engagement with anilox roll 14 by the pneumatic bladder 22. Bladder 22 is positioned between manifold 24 and the rear wall 20 of ink fountain 12, as previously described. Air is supplied to and exhausted from bladder 22 through an air supply conduit 46. The air may be supplied and exhausted by any conventional means. By pressurizing bladder 22, seal means 28 are biased into sealing engagement with the surface of anilox roll 14. The biasing force can be controlled by controlling the internal pressure of bladder 22. Since bladder 22 is pneumatically pressurized, bladder 22 is resilient. That is, bladder 22 permits divider seal 10 to move toward and away from rear wall 20 as anilox roll 14 rotates, to compensate for variations in the surface of anilox roll 14, such as a slightly out-of-round condition or slight misadjustment, for example where the ink fountain 12 is not exactly parallel to the axis of anilox roll 14. In addition, bladder 22 enables divider seal 10 to move toward anilox roll 14 to compensate for wear of both the surface of anilox roll 14 and the contoured surface 30 of seal means 28, as a result of normal use. Since air is compressible fluid, bladder 22 can be pressurized to a degree that will enable divider seal 10 to move toward and away from rear wall 20 of ink fountain 12, as may be required by out-of-round conditions in anilox roll 14, misalignments, and wear.

It will be appreciated that ink fountain 12 can be divided into two or more compartments 48 and 50 (see FIG. 2) by using one or more divider seals 10. Thus, ink fountain 12 may be divided into two compartments 48 and 50 by using a single divider seal 10. If two divider seals are used, ink fountain 12 can be divided into three compartments, and so on, so that any number of compartments as desired may be provided.

It will also be noted that neither bladder 22 nor divider seal 10 are fixedly attached to rear wall 20 of ink fountain 12. Thus, divider seal 10 can be placed at any desired location along anilox roll 14, so that the lateral

extent of the compartments 48 and 50 can be infinitely variable. Thus, the invention permits not only any desired number of compartments to be formed in ink fountain 12, but enables the lateral extent of the compartments so formed to be infinitely varied as desired. Hence, the present invention makes it very simple to reconfigure ink fountain 12 for different colors and dimensions. This reduces set-up time between printing runs, thereby reducing press down time and increasing equipment utilization and throughput.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof and, accordingly, reference should be made to the appended claims, rather than to the foregoing specification, as indicating the scope of the invention.

I claim:

1. A divider seal for a split-fountain chambered doctor blade for a printing press, comprising

a. seal means contoured to sealingly engage a circumferential surface of a rotating cylinder,

b. retaining means for retaining the seal means in sealing engagement with the rotating cylinder,

c. pneumatic biasing means positionable with the retaining means and acting on the retaining means for resiliently biasing the seal means into sealing engagement with the rotating cylinder; and

means for mounting the retaining means and the pneumatic biasing means for axial movement together along the surface of the cylinder, thereby allowing the retaining means and the pneumatic biasing means to be selectably positionable along the surface of the cylinder.

2. A divider seal according to claim 1, wherein the pneumatic biasing means comprises a pneumatic bladder.

3. A divider seal according to claim 2, said pneumatic bladder further comprising a conduit for selectably permitting an increase or decrease in pneumatic pressure in said bladder.

4. A divider seal according to claim 2, wherein the seal means comprises an ultra-high molecular weight closed foam.

5. A divider seal according to claim 1, further comprising a gap between the retaining means and the circumferential surface of the rotating cylinder, and means for supplying a liquid to said gap to form a liquid interface between said retaining means and circumferential surface.

6. A divider seal according to claim 1, wherein said retaining means comprises recess means for receiving the pneumatic biasing means, thereby fixedly attaching the biasing means to the retaining means.

7. In a flexographic printing press having an anilox roller with an outer circumferential surface and a chambered doctor blade ink fountain adjacent the anilox roller for applying printing ink thereto, a positionable divider seal for dividing the doctor blade chamber into at least two compartments, the compartments containing different color inks therein, said divider seal comprising a seal member contoured to and in sealing engagement with the outer circumferential surface of the anilox roller, a seal retainer for retaining the seal member in engagement with the circumferential surface of the anilox roller, and an inflatable and deflatable pneumatic bladder operatively engaged with the seal retainer and positionable with said divider seal for applying a biasing force to the seal retainer and the seal member for resiliently biasing the seal member into engagement with the circumferential surface of the anilox roller, and means for mounting the divider seal and the bladder for axial movement together along the surface of the roller, thereby allowing the divider seal and the bladder to be selectably positionable along the surface of the roller.

8. A divider seal according to claim 7, wherein said pneumatic bladder is positioned between the seal retainer and a rear wall of the ink fountain.

9. A divider seal according to claim 8, wherein the divider seal and the pneumatic bladder are both longitudinally positionable with respect to said rear wall of the ink fountain, thereby allowing the divider seal to be infinitely positionable along the length of the anilox roll between the anilox roll and said rear wall of the ink fountain.

10. An inflatable and deflatable pneumatic bladder according to claim 7, wherein said divider seal comprises recess means for receiving the bladder, thereby fixedly attaching the bladder to the divider seal.

11. Printing apparatus comprising an ink fountain mounted adjacent to a roll adapted to receive a film of ink from the fountain, the fountain comprising an ink chamber extending parallel to the axis of the roll and containing a chamber divider having a first preselected width which is selectably positionable at various positions in the chamber, the chamber divider including at least one sealing portion having a concave surface adjacent to and conforming with the surface of the roll, and including a bladder positioned between a back surface of the divider and an opposed wall of the chamber and adapted to seal the gap between the said back surface and the chamber wall and, when pressurized, to bias the concave seal surface of the divider resiliently into sealing engagement with the roll, the bladder having a second preselected width which is not greater than the first preselected width.

12. Printing apparatus according to claim 11, in which the chamber divider includes a second sealing portion spaced from and similar to the first-mentioned sealing portion, the surface of the divider between the sealing portions being recessed to define a semi-annular chamber adjacent to the roll, and including means for delivering liquid into the semi-annular chamber to form an additional barrier, supplementing the sealing effects of the seal portions, between inks contained during use in the portions of the ink chamber on opposite sides of the divider.

13. Printing apparatus according to claim 11, wherein the back surface of the divider comprises recess means for receiving the bladder, thereby attaching the bladder to said divider.

14. Printing apparatus according to claim 13, in which said recess means hold said bladder so as to allow said bladder to be positionable with said divider.

15. Printing apparatus according to claim 11, in which the said back surface of the divider and the said opposed chamber wall are both substantially flat and are both substantially parallel to a tangent to the roll at approximately a midpoint along the said concave surface of the sealing portion, whereby expansion of the bladder produces a series of biasing forces on the divider which are substantially parallel to a radius of the roll at the said midpoint.

16. Printing apparatus according to claim 15, in which the chamber divider includes a second sealing portion spaced from and similar to the first-mentioned

sealing portion, the surface of the divider between the sealing portions being recessed to define a semi-annular chamber adjacent to the roll, and including means for delivering liquid into the semi-annular chamber to form an additional barrier, supplementing the sealing effects of the seal portions, between inks contained during use in the portions of the ink chamber on opposite sides of the divider.

17. A divider seal in a split-fountain chambered doctor blade for a printing press having an ink chamber, comprising

a. seal means contoured to sealingly engage a circumferential surface of a rotating cylinder,

b. retaining means having a first preselected width for retaining the seal means in sealing engagement with the rotating cylinder, and

c. pneumatic biasing means disposed between a back surface of said retaining means and an opposed wall of said ink chamber and acting on the retaining means for resiliently biasing the seal means into sealing engagement with the rotating cylinder, the pneumatic biasing means having a second preselected width which is not greater than the first preselected width.

18. A divider seal according to claim 17, wherein said retaining means is positionable to various positions within the ink chamber, said retaining means comprising recess means for receiving the pneumatic biasing means, thereby fixedly attaching the biasing means to the retaining means, said recess means holding said biasing means so as to allow said pneumatic biasing means to be positionable with said retaining means.

19. A divider seal according to claim 17, wherein said retaining means comprises recess means for receiving the pneumatic biasing means, thereby fixedly attaching the biasing means to the retaining means.

20. In a flexographic printing press having an anilox roller and a chambered doctor blade ink fountain adjacent the anilox roller for applying printing ink thereto, a divider seal having a first preselected width for dividing the doctor blade chamber into at least two compartments, the compartments containing different color inks therein, said divider seal comprising a seal member contoured to and in sealing engagement with the outer circumferential surface of the anilox roller, a seal retainer for retaining the seal member in engagement with the circumferential surface of the anilox roller, and an inflatable and deflatable pneumatic bladder mounted between a back surface of the divider seal and an opposed wall of the doctor blade chamber for applying a biasing force to the seal retainer and the seal member for resiliently biasing the seal member into engagement with the circumferential surface of the anilox roller, the bladder having a second preselected width which is not greater than the first preselected width.

21. A bladder according to claim 29 wherein said divider seal is selectably positionable at various positions in the chamber, the divider seal comprising recess means for receiving the bladder, thereby fixedly attaching the bladder to the divider seal so as to allow the bladder to be positionable with said divider seal.

22. A bladder according to claim 20 wherein said divider seal comprises recess means for receiving the bladder, thereby fixedly attaching the bladder to the divider seal.

23. Printing apparatus comprising an ink fountain mounted adjacent to a roll adapted to receive a film of ink from the fountain, the roll having an outer circumferential surface, the fountain comprising an ink chamber extending parallel to the axis of the roll, at least a portion of the chamber containing a chamber divider which is selectably positionable at various positions in the chamber, the chamber divider including at least one sealing portion having a concave surface adjacent to and conforming with the surface of the roll, and including a bladder selectably positionable with the divider, and adapted to seal the gap between the said back surface and the chamber wall and, when pressurized, to bias the concave seal surface of the divider resiliently into sealing engagement with the roll, and means for mounting the divider and the bladder for axial movement together along the surface of the roll, thereby allowing the divider and bladder to be selectably positionable along the surface of the roll.

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EIDGENÖSSISCHES AMT FÜR GEISTIGES EIGENTUM

PATENTSCHRIFT

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HAUPTPATENT

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Farbwerk für Buchdruck-, Offsetdruck- und dergleichen Maschinen für Farbendruck

Beim Druck von Tageszeitungen und Zeitschriften ist es für das bessere Hervorheben von einzelnen Annoncen wünschenswert, diese spaltenweise oder seitenweise in verschiedenen Farben drucken zu können, ohne dabei mehr als ein Farbwerk beanspruchen zu müssen. Zu diesem Zweck muß, wenn nicht besondere Einrichtungen vorhanden sind, beim Umstellen auf mehrere nebeneinanderliegende Farben das ganze Farbwerk sauber gereinigt werden. Das Reinigen der Farbwerkwalzen geht dabei sehr rasch und mühelos vor sich, da hierfür Apparate verwendet werden können, welche das Reinigen maschinell besorgen. Ganz anders verhält es sich mit dem Farbkasten. Dieser muß von Hand sauber von allen Spuren der vorhergehenden Farbe befreit werden. Die Unterteilung kann erst dann durch Einsetzen von Abteilwänden in den Farbkasten vorgenommen werden. Man hat daher nach Mitteln gesucht, das Reinigen des Farbkastens zu umgehen, indem man zusätzliche, komplette Farbkasten mit besonderen Duktoren und Farbmessern, oder komplette Pumpen, meist eine Seite breit, fest oder auswechselbar in die Maschine eingebaut hat. Diese Zusatzapparate übertragen dann ihre Farbe an anderer Stelle an die Farbwerkwalzen, als dies beim normalen Druck mit nur einer Farbe der Fall ist. Diese Zusatzaggregate haben verschiedene Nachteile. Einmal sind sie recht teuer, da sie die komplette Farbdosierungseinrichtung enthalten, wenn auch kleiner als die ohnehin für einfarbigen Druck vorhandene Einrichtung. Viele Inserenten wünschen nicht nur eine bestimmte Grundfarbe, sondern einen bestimmten Farbton, welcher oft mit der Verpackung des angepriesenen Artikels übereinstimmen muß. Daraus ergibt sich die Notwendigkeit, diese Zusatzapparate jeweils doch reinigen zu müssen oder aber eine ganze Menge solcher Apparate anzuschaffen. Die Montage der Zusatzapparate muß zudem recht genau sein, da von der Genauigkeit der Montage die Güte der Farbgebung abhängt. Das genaue Montieren der Zusatzapparate in stark verschmutzte Maschinen, vorgenommen durch mechanisch ungeschultes Personal, ist jedoch eine heikle Sache. Als weiterer Nachteil ist zu nennen, daß das Farbregulieren immer an diesen Zusatzapparaten selbst, also in der laufenden Maschine, vorgenommen werden muß, während an den Einrichtungen, welche für den Einfarbendruck ohnehin vorhanden sind, oft die Bequemlichkeit vorhanden ist, daß die Farbschrauben von außerhalb der Maschine aus bedienbar sind. Mit den erwähnten Zusatzapparaten geht somit diese Bequemlichkeit für den Farbendruck verloren.

Die Erfindung beseitigt diese Nachteile. Sie benützt eine Duktorwalze, die zur Führung der Teilfarbbehälter Rillen aufweist, die die Teilfarbbehälter an den Seitenwänden

halten, wobei sämtliche Teilfarbbehälter in einem größeren, um eine horizontale Achse verschwenkbaren Farbbehälter auswechselbar gehalten sind, welcher Farbbehälter an der dem Gelenk gegenüberliegenden Seite durch eine ausklinkbare Lasche in der Arbeitsstellung in solcher Höhe gehalten wird, daß eine genaue Trennung der Teilfarben gewährleistet ist.

Beigefügte Zeichnung stellt ein Ausführungsbeispiel des Erfindungsgegenstandes dar, und zwar zeigt:

Fig. 1 einen Querschnitt durch einen Teil des Farbwerkes, wenn es für Einfarbendruck eingerichtet ist,

Fig. 2 einen Querschnitt durch denselben Teil des Farbwerkes, wenn es für beispielsweise drei nebeneinander laufende, verschiedene Farben eingerichtet ist,

Fig. 3 einen Längsschnitt aus Fig. 2.

Zwischen den Maschinenwänden 1 und 2 ist Traverse 3 befestigt, welche Farbmesserbalken 4 mit den Farbschrauben 5 und Farbmessern 6 trägt. An Traverse 3 ist ferner Farbbehälter 7 um eine horizontale Achse schwenkbar befestigt und mittels Lasche 8 in Arbeitslage gehalten. Duktorwalze 9 mit Rillen 10 zur seitlichen Führung der Teilfarbbehälter taucht in den Farbvorrat 11. Bei ihrer Drehung in Pfeilrichtung nimmt sie die an ihr haftende Farbe mit, welche durch Farbmesser 6 teilweise, je nach Bedarf, abgestreift wird. Farbübertragungswalze 12 übernimmt die Farbe vom Duktor und gibt sie an die Farbwerkwalzen weiter. Wird Farbendruck gewünscht, beispielsweise drei Farben nebeneinander, dann wird der Farbvorrat 11 über Ventil 14 mittels rückwärtslaufender Pumpe und elastischer Schlauchverbindung rasch in den Vorratstank 15 abgelassen. Ohne besondere Reinigung und ohne besondere Vorsicht oder Genauigkeit werden darauf Teilfarbbehälter 16, 17 und 18 bei abgeschwenktem Farbbehälter 7 in denselben eingelegt. Nachdem der Farbbehälter 7 samt den Teilfarbbehältern 16, 17 und 18 wieder in Arbeitslage geschwenkt und die Duktorwalze 9 sowie die übrigen Farbwerkwalzen 12, 13 und das Farbmesser 6 gereinigt sind, können die gewünschten Farben 19, 20 und 21 in die Teilfarbbehälter 16, 17 und 18 eingefüllt oder die darin bereits von früheren Arbeiten noch enthaltene Farbe zum Drucken verwendet werden. Das Reinigen dieser Teilfarbkasten kann außerhalb der Maschine vorgenommen werden und gestaltet sich wegen ihrer Kleinheit und einfachen Form sehr mühelos. Statt die Teilfarbbehälter immer wieder zu reinigen, kann von den relativ billigen Teilfarbbehältern eine große Zahl vorrätig gehalten werden. Während des Druckens kann mit den gleichen Farbstellschrauben gearbeitet werden, ob nun einfarbig oder mehrfarbig gedruckt wird. Durch die ausklinkbare Lasche 8 wird der Farbbehälter 7 in solcher Höhe gehalten, daß eine genaue Trennung der Teilfarben gewährleistet ist.

PATENTANSPRUCH

Farbwerk für Buchdruck-, Offsetdruck- und dergleichen Maschinen, bei dem die Duktorwalze in den in Teilfarbbehältern enthaltenen Farbvorrat eintaucht und die regulierbaren Farbabstreifmesser oberhalb des Farbvorrates angebracht sind, dadurch gekennzeichnet, daß die Duktorwalze (9) zur Führung der Teilfarbbehälter (16, 17 und 18) Rillen (10) aufweist, die die Teilfarbbehälter an den Seitenwänden halten, und daß sämtliche Teilfarbbehälter in einem größeren, um eine horizontale Achse verschwenkbaren Farbbehälter (7) auswechselbar gehalten sind, welcher Farbbehälter (7) an der dem Gelenk gegenüberliegenden Seite durch eine ausklinkbare Lasche in der Arbeitsstellung in solcher Höhe gehalten wird, daß eine genaue Trennung der Teilfarben gewährleistet ist.

UNTERANSPRÜCHE

1. Farbwerk nach Patentanspruch, dadurch gekennzeichnet, daß der Farbmesserbalken (4) auf der die seitlichen Ständer verbindenden Traverse (3) einstellbar gehalten ist

und das Farbmesser (6) und die Farbschrauben (5) trägt.

2. Farbwerk nach Patentanspruch und Unteranspruch 1, dadurch gekennzeichnet, daß der Farbbehälter (7) mit einem Vorratstank (15) durch eine elastische Schlauchverbindung mit Hahn und Pumpe verbunden ist.

Maschinenfabrik
Winkler, Fallert & Co. AG
Vertreter: Naegeli & Co., Bern

Patent Nr. 319962
1 Blatt

FIG. 1

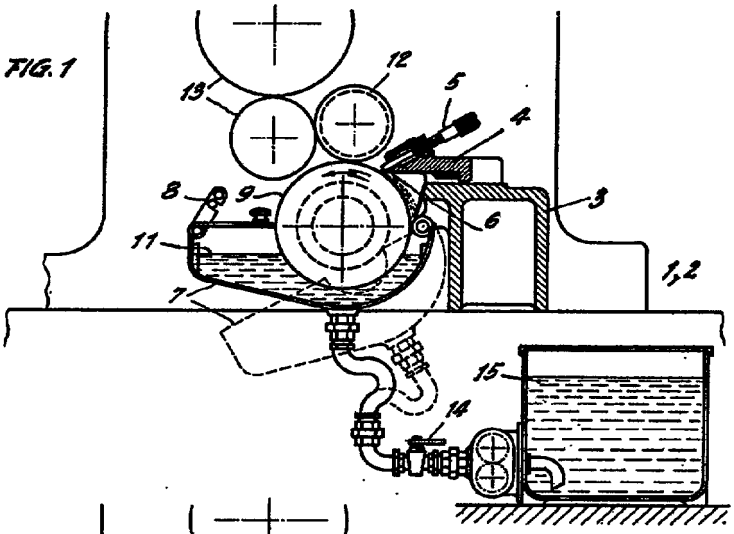


FIG. 2

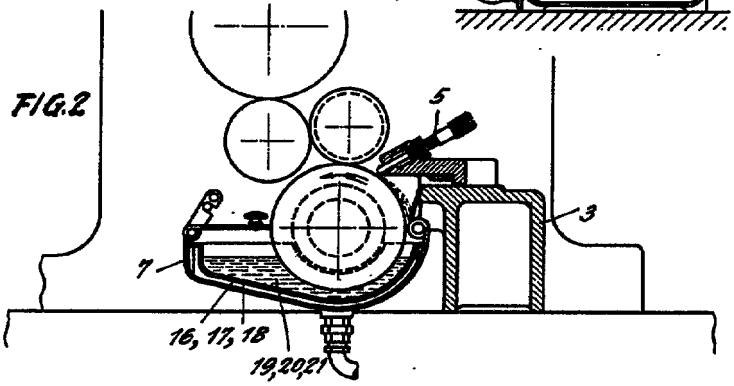
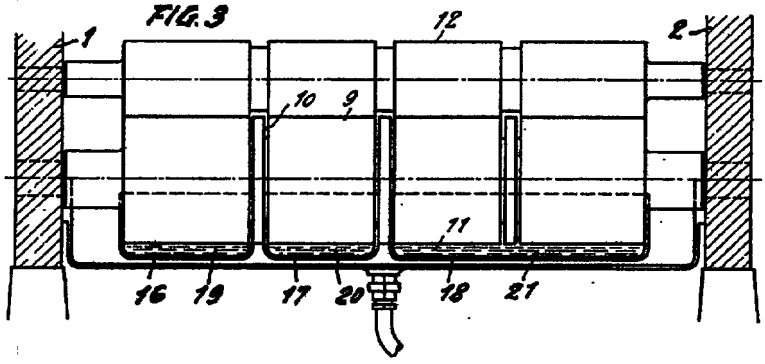


FIG. 3



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United States Patent [19]

Fischer

[11] 4,423,677

[45] Jan. 3, 1984

[54] ROTARY SHEET OFFSET PRINTING MACHINE

[75] Inventor: Hermann Fischer, Augsburg, Fed. Rep. of Germany

[73] Assignee: M.A.N.-ROLAND Druckmaschinen Aktiengesellschaft, Offenbach am Main, Fed. Rep. of Germany

[21] Appl. No.: 353,230

[22] Filed: Mar. 1, 1982

[30] Foreign Application Priority Data

Mar. 7, 1981 [DE] Fed. Rep. of Germany 3108808

[51] Int. Cl.[3] B41F 13/24

[52] U.S. Cl. 101/232; 101/184

[58] Field of Search 101/232, 247, 182–185, 101/174–175

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Primary Examiner—E. H. Eickholt

Attorney, Agent, or Firm—Frishauf, Holtz, Goodman & Woodward

[57] ABSTRACT

To permit double inking of the blanket cylinder (6, 7; 44, 45) of an offset printing machine, in which all the cylinders are the same, and further to permit retrofitting of an existing printing machine, a control unit (C) is connected to the blanket cylinders which are located in movable bearings to engage or disengage the blanket cylinders, in intermittent movement, from a cooperating impression cylinder (8, 9; 46) when a sheet supply apparatus (3, 41) is commanded to feed a sheet only for every other revolution of the printing system, thereby permitting double inking of the blanket cylinder and preventing contact of the inked blanket cylinder with the impression cylinder when no sheet is being fed thereto.

6 Claims, 4 Drawing Figures

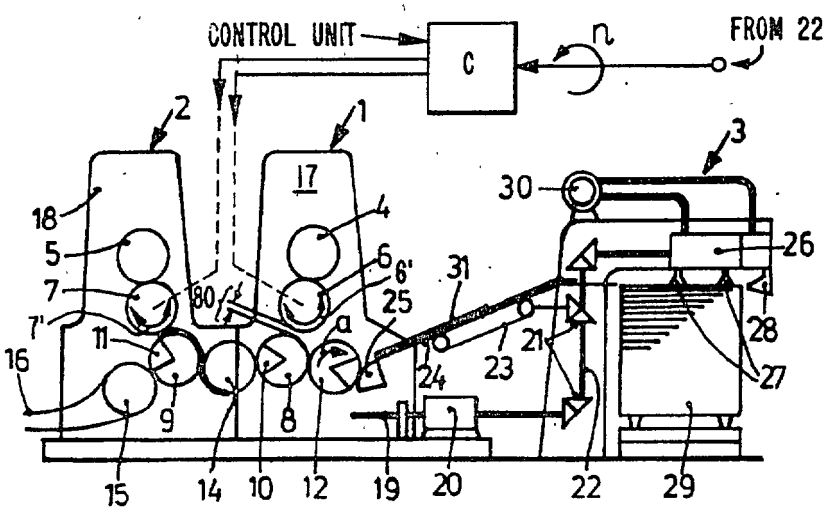


Fig.1

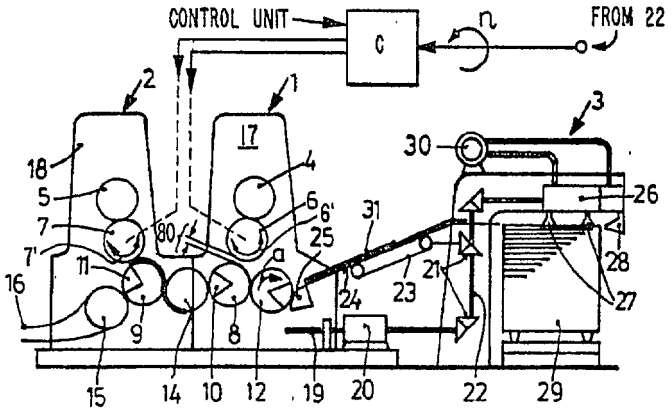


Fig.2

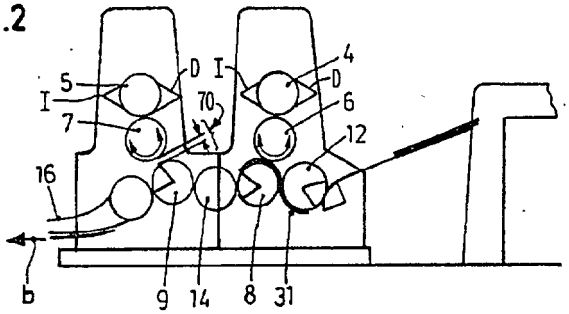


Fig. 3

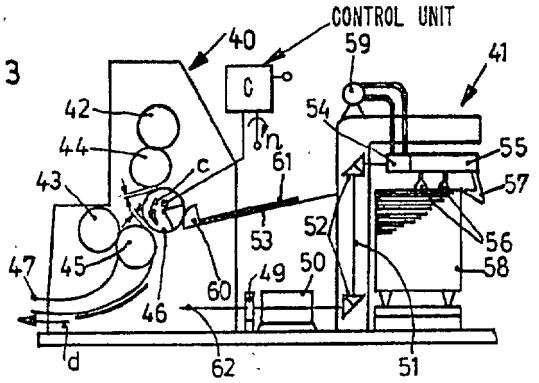
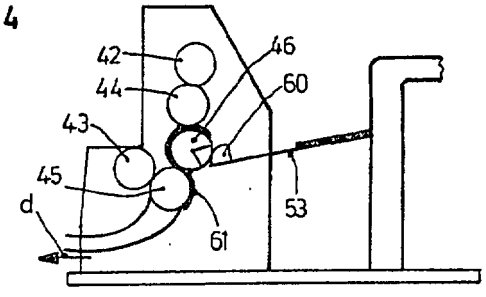


Fig.4



ROTARY SHEET OFFSET PRINTING MACHINE

Cross reference to related applications, assigned to the assignee of this application, the disclosure of which is hereby incorporated by reference:

U.S. Ser. No. 353,229, filed Mar. 1, 1982 now as U.S. Pat. No. 4,409,894 Oct. 18, 1983, FISCHER (claiming priority Fed. Rep. Germany No. P 31 08 806.6); U.S. Ser. No. 353,235, filed Mar. 1, 1982 now U.S. Pat. No. 4,414,896 Nov. 15, 1983, FISCHER (claiming priority Fed. Rep. Germany No. P 31 08 807.4);

The present invention relates to offset printing machines and more particularly to a sheet-fed rotary offset printing machine having a sheet supply apparatus, and which is so arranged that the operating conditions of the machine can be readily matched and headed background. A rotary offset printing machine of the type to which the present invention relates has a plate cylinder and at least one rubber or blanket cylinder, continuously in contact with the plate cylinder and further an impression or printing cylinder; all the cylinders have the same diameter. A printing machine of this type is described, for example, in Walenski, "Einführung in den Offsetdruck", pp. 113, 114 and 137 ("Introduction to Offset Printing"). The blanket cylinder is inked once and provides for printing once for each revolution. Many printing jobs can be carried out by a machine of this type, and satisfactory reproduction of printed subject matter is entirely possible. In some instances, however, inking the rubber cylinder once for each impression is not enough; this may occur when the requirements for printed quality are particularly high and if highly viscous ink is used or the printed substrate, typically paper, has an uneven surface.

It has been proposed, see the aforementioned book, page 113, to utilize a blanket cylinder with an impression cylinder of twice the size and which carries a sheet only about half its circumference, the other half of the circumference being set back with respect to the first half. Thus, for each revolution of the printing cylinder, two revolutions of the associated blanket cylinder will result, causing the blanket cylinder to be inked twice. Based on the construction of the machine, however, double inking will necessarily result at all times, even if the particular printing job would not require double inking as such.

THE INVENTION

It is an object to provide a printing machine in which change-over of single, or double inking of the blanket cylinder can be readily accomplished without changing the size or arrangement of the cylinders of the machine, so that, double or sing inking can be controlled as required. For one mode of operation, double inking can be effected. For normal or ordinary operation, the machine can likewise operate with only a single inking step for each passage of a sheet therethrough.

Briefly, the plate cylinder, the blanket cylinder and the printing or impression cylinder all have the same diameter. The machine is associated with a sheet supply apparatus which can be operated in two speed ranges so that, depending on its adjustment, the cylinders will receive a sheet for each revolution or only for every other revolution; if only half the number of sheets, per unit time, are commanded, that is, for every other revolution, the rubber cylinder and the printing cylinder are separated from each other in such a manner that after a sheet has passed between the blanket cylinder and the associated printed cylinder a subsequent free running or free wheeling revolution or cycle is controlled during which the rubber blanket cylinder and the printing or impression cylinder are separated from each other, to permit inking of the blanket cylinder without an impression being printed, or transferred to a sheet of paper.

DRAWINGS

FIG. **1** is a schematic side view of the printing machine arranged to carry out the different printing operations in accordance with the present invention;

FIG. **2** is a fragmentary view of FIG. **1** in a different operating phase thereof;

FIG. **3** is a second embodiment of a printing machine; and

FIG. **4** is a schematic side view of the machine of FIG. **3** in a different operating phase than that of FIG. **3**.

Embodiment of FIGS. **1** and **2**: A two color sheet offset rotary printing machine in serial construction is illustrated. The machine has two printing stations **1, 2** and a common sheet supply apparatus **3**. Each one of the printing stations **1, 2** has a plate cylinder **4, 5**, a rubber blanket cylinder **6, 7**, and a printing or impression cylinder **8, 9**. Inkers I and dampers D associated with the plate cylinders and rubber cylinders **6, 7** are shown only schematically in FIG. **2**; they have been omitted from the other Figures of the drawings for clarity. They can be of any suitable and well known construction. The printing cylinders **8, 9** have grooves **10, 11** which retain sheet grippers, not shown in detail and which may be of any well known suitable construction. A sheet supply drum **12**, which is also formed with grippers is provided. The printing station **2** includes sprocket wheels **15** which retain a chain conveyor **16** having suitable grippers to transport the printed sheets to a sheet delivery station, not shown and of any suitable and well known construction.

In accordance with the invention, each one of the blanket cylinders **6, 7** is so journaled at the side walls **17, 18** of the printing stations **1, 2** that it can be selectively moved in a curve about the plate cylinders **4, 5** respectively, to assume the positions shown in FIGS. **1** and **2**, respectively. Contact with the associated plate cylinders **4, 5** is continuously maintained. Movement of the blanket cylinder **6, 7** in this manner can be readily obtained by journaling the blanket cylinders in bearings which are retained in eccenters positioned in the respective sidewall **17, 18** of the printing stations. Movement of the blanket cylinders, by rotating the eccenters, can be obtained, for example, by hydraulic cylinder-piston arrangements or similar apparatus. The hydraulic positioning piston, or similar apparatus, is operated in timed sequence by an electrical or mechanical control unit C to thereby control the positioning of the respective blanket cylinder **6, 7**. A suitable control unit may, for example, be a timer element providing electrical control pulses to open, or close an electrically controlled valve to admit pressurized hydraulic fluid to a hydraulic positioning piston or to drain hydraulic fluid therefrom; a suitable mechanical control unit may be a pushrod operated by a cam. Positioning devices of this type are known, and were used in the past to control introduction of the first sheet from a stack into the printing machine and subsequently thereto to engage the blanket cylinder with the printing cylinder independent of the feeds to the respective printing line. The present inven-

tion, thus, can use this portion of the existing equipment, modified merely to be able to carry out the additional function required thereof in accordance with the present invention, which will be described in detail below.

The sheet supply apparatus 3 is driven from a main driveshaft 19 of the machine over a two-stage change gear box 20 and a drive train having bevel wheel gearing therein to provide the right-angle drive, as schematically shown at 21. The drive train 22 is coupled to conveyor belt 23 which supplies sheets over a make-ready table 24 to a gripper pickup 25. The drive train 22 further is connected to transmit rotary power to a sheet lifting or pickup device 26 which has longitudinally movable suction cups or suction grippers 27 and separating jet nozzles 28, to pick up the uppermost sheet from a stack of sheets 29 and supply that uppermost sheet to the make-ready table 24. The sheet pickup device 26 not only includes mechanical means to move the suction cups 27 but, additionally, control means which supply the suction grippers 27 with vacuum for suction and the nozzle 28 with compressed air for separation of sheets. Compressed air and suction, that is, the pneumatic system is supplied from a pump 30. The gear box 20 has a selectable transmission ratio of 1:1 and 2:1.

Operation, with reference to FIGS. 1 and 2:

The printing machine is illustrated for operation for double inking of the blanket cylinder 6, 7. FIG. 1 illustrates the machine at the instant of time in which the gripper pickup apparatus 25 picks up a sheet 31. The blanket cylinder 6 is spaced from the associated printing or impression cylinder, as schematically indicated by the spacing lines 18 A sheet has just entered the printing station 2, and is being printed-on by being passed between the blanket cylinder 7 and the printing or impression cylinder 9, which are in engagement with each other.

Upon rotation of the printing machine from the position shown in FIG. 1, in the direction of the arrow a as shown on the sheet supply drum 12, the gripper pickup 25, will after short movement of the sheet 31 forwardly, transfer the sheet to the gripper of the printing cylinder 8. Upon further rotation of the printing cylinder 8 so that the groove 10 (FIG. 1) thereof will reach a tangential position with respect to the blanket cylinder 6, the blanket cylinder 6 is engaged with the printing cylinder 8, so that the sheet 31 will receive the first impression thereon. After rotation of the cylinder 6 for one revolution, starting from the position shown in FIG. 1, that is, by 360°, the various cylinders will have the position shown in FIG. 2. Upon further rotation of the cylinders, the sheet 31 is transferred to the transport drum 14 which supplies the sheet thereafter to the impression cylinder 9. As soon as the trailing end of the sheet 31 has left the niche between the cylinder 6 and 8, blanket cylinder 6 is disengaged from the impression cylinder 8 in order to prevent smearing or soiling of the surface of the impression cylinder 8 during the subsequent idle or free wheeling phase of the blanket cylinder 6. The blanket cylinder 6, however, remains in continuous contact with the plate cylinder 4 so that, during this idle or free wheeling phase, it can receive an inked impression from the plate cylinder 4.

As soon as the leading edge of the sheet 31 has reached the gap between the cylinders 7 and 9, blanket cylinder 7 is engaged with the impression cylinder 9. Subsequently, and during the passage of the sheet between cylinders 7 and 9, the sheet is printed with the second color. When the leading edge of the sheet 31 reaches chain 16, the grippers thereof receive the sheet and carry the sheet off in the direction of the arrow b to a sheet delivery station (not shown). As soon as the trailing end of the sheet 31 has left the impression line between the cylinders 7 and 9, the blanket cylinder 7 is disengaged from the impression cylinder 9, retaining, however, contact with the plate cylinder 5. During the subsequent free wheeling or idling phase of the blanket cylinder 7, which extends for a full revolution thereof, the blanket cylinder receives an additional inking with the second color. The lifted-off condition of the blanket cylinder 7 is shown schematically by the gap 17 in FIG. 2.

Multiple color printing with double-inking results in the decrease in the number of sheets imprinted on per unit time. The number of sheets, which is half with respect to a single-inking printing is obtained by changing the gearing in gear box 20 to a transmission of 2:1 so that, with respect to the revolutions of the cylinders in the printing machine, only half the number of sheets are supplied by the gripper pickup 25 to the machine system, in comparison to the number of sheets for single-inking operation.

Operation of the machine to carry out ordinary, single-sided two-color printing without double inking is known, so that a description thereof is not necessary.

Embodiment of FIGS. 3 and 4:

A sheet offset rotary printing machine having a double printing station 40 and a printing supply device 41 is so constructed that two plate cylinders 42, 43 are in continuous rotary engagement with two blanket cylinders 44, 45, cooperating with a common impression cylinder 46. The blanket cylinders 44, 45 can be moved in position with respect to the impression cylinder 46, by eccentrically located bearings or by pivoting levers. The engagement with the associated plate cylinders 42, 43 is maintained. The two ends of the blanket cylinder 45 have a sprocket wheel attached thereto - not shown in detail, which guides a sheet removal chain 46, supplied with grippers to pick up sheets and transport them to the removal station. The inking systems and damping systems associated with the plate cylinders have not been shown and may be of any suitable construction.

A main drive shaft 62 receives driving power over a belt drive 49 from a motor 50. The main drive shaft 62 is connected to a drive train 51 having bevel gears 52 thereon. The drive train 51, similar to the drive train shown in FIG. 1, has branch gearing arrangements which are used to drive transport belts or conveyors of a make-ready table 53 and additionally are connected to a control unit 54 and a sheet lifting apparatus 55 having suction grippers 56 and compressed air nozzles 57. The sheet lifting or separating device 55 operates the suction grippers 56 such that they pick up the uppermost sheet of a stack of sheets 58 and supply that sheet to the make-ready table 53. Suction and compressed air lines extend from the control unit 54 to a pump 59. The control unit 54 controls supply of suction air as well as of compressed air to the suction grippers 56 and to the nozzle 57, respectively, in such a manner that, upon setting of the printing machine to single inking, the suction grippers are connected upon each movement to the suction source, in order to supply a sheet from the stack 58 to the make-ready table 53.

If double-inking is desired, the control unit 54 so controls suction air and compressed separating air that pneumatic suction and blowing air is supplied only upon each second movement of the lifting device 55. Simi-

larly, the compressed air nozzle 57 receives compressed air, in clocked sequence, only when the grippers or suction cups 56 are connected to the source of vacuum. Thus, and with reference to machine operating speed, only half the number of sheets is removed from the stack and supplied to the machine than the number which, at the same operating speed of the machine, is supplied to the make-ready table 53 when normal, single-inking is required or commanded. Pickup grippers 60 transfer the sheet from the make-ready table 53 to the printing cylinder 46.

Operation: Starting from the position of the elements shown in FIG. 3, the printing cylinder 46 is moved in the direction of the arrow c. After a short movement, a sheet 61 is supplied by the pickup 60 thereto and transported to the printing line between the blanket cylinder 44 and the printing cylinder 46. The blanket cylinder 44 is engaged with the printing cylinder 46 just before the leading edge of the sheet 61 reaches the printing or contact line. Printing is effected between the cylinders 44 and 46 with the first color.

As the leading edge of the sheet 61 approaches the blanket cylinder 45, blanket cylinder 45 is engaged with the printing cylinder 46. Immediately thereafter, the grippers of the chain 47 grip the sheet which thereby is transferred from the grippers of the printing cylinder 46. During the following phase of sheet movement between the printing cylinder 46 and the blanket cylinder 45, printing is effected by a second color. When the trailing end of the sheet 61 leaves the printing or impression line between cylinders 44 and 46, the blanket cylinder 44 is returned in the position shown in FIG. 3. The blanket cylinder 44 remains in contact with the plate cylinder 42 and thus is inked thereby. Similarly, as soon as the trailing end of the sheet 61 leaves the printing line between the blanket cylinder 45 and the impression cylinder 46, the blanket cylinder 45 is disengaged from the printing cylinder 46 but remains in contact with the plate cylinder 43 so that the blanket cylinder, during the sequence idling revolution, or idling phase, will receive an additional coating of ink. The gaps between the blanket cylinders 44, 45 and the impression cylinder 46 are, respectively, illustrated by the dimension line between the respective cylinders in FIG. 3, unnumbered, however, for clarity of presentation.

Various changes and modifications may be made, and features in connection with one of the embodiments may be used with the other, within the scope of the inventive concept. Thus, a control unit similar to control unit C (FIG. 1) can be used in the embodiment of FIGS. 3 and 4 to effect respective engagement and disengagement of the blanket cylinder 44, 45 with the impression cylinder 46, coupled and synchronized with operation of the pneumatic control unit 54, and hence also synchronized with the rotation of the respective cylinders. Rotary information is entered in the control unit C (FIG. 1) as schematically indicated by the arrow n derived, for example, from a mechanical connection with the drive train 22.

I claim:

1. Rotary sheet offset printing machine having

a sheet supply apparatus (3, 41);

at least one plate cylinder (4, 5; 42, 43);

at least one rubber blanket cylinder (6, 7; 44, 45) associated with the at least one plate cylinder and, during printing, positioned for continuous contact therewith;

means (I) for supplying ink to the at least one plate cylinder;

and a printing, or impression cylinder (8, 9; 46),

said at least one blanket cylinder and said impression cylinder being relatively shiftable with respect to each other for selective printing engagement or for surface separation, respectively;

wherein, in accordance with the invention,

all said cylinders have the same diameter;

said sheet supply apparatus (3, 41) has two different sheet supply rate settings to supply, for one predetermined cylinder speed, in a first supply setting, a predetermined number of sheets per unit time and, for said same predetermined cylinder speed, in a second supply setting, half the number of predetermined sheets per unit time;

and control means (C) are provided, connected to and controlling the relative position of the at least one blanket cylinder (6, 7; 44, 45) and the printing, or impression cylinder (8, 9; 46) such that

(a) when said sheet supply apparatus is in the second supply setting, the blanket and impression cylinders are moved to a separated position during a first revolution of the cylinders to provide for inking of the blanket cylinder, and the blanket cylinder and the impression cylinder are moved to engaged position during a second or subsequent revolution, to permit double inking of the blanket cylinder from the plate cylinder without transfer of printing information from the blanket cylinder after the first inking, and printing on a sheet during said subsequent revolution,

and

(b) when said sheet supply apparatus is in said first supply setting, the blanket and impression cylinders are in continuous printing engagement to provide for single inking of the blanket cylinder and sheet feed at said predetermined number per unit time.

2. Printing machine according to claim 1, wherein said control means (C) moves the blanket cylinder (6, 7; 44, 45) away from the impression cylinder in movement about the circumference of the associated plate cylinder (4, 5; 42, 43).

3. Printing machine according to claim 1, including a main drive shaft (19) connected to drive the sheet supply apparatus (3);

and a two-step gear change box (20) included in the drive shaft having two transmission ratios of 1:1 and 2:1, respectively.

4. Printing machine according to claim 1, wherein said sheet supply apparatus (41) comprises means for lifting and pickup of a sheet including pneumatic means (55) to lift sheets (61) from a stack (58) of sheets;

and the control means controls the pneumatic device for pneumatic suction application, and hence lifting of the sheet, selectively, for each pickup or lifting movement of said sheet supply apparatus or, selectively, for every other sheet pickup or lifting movement thereof.

5. Printing machine according to claim 4, wherein said control means includes a pneumatic control apparatus.

6. Printing machine according to claim 1, wherein a main drive shaft (19, 62) is provided, coupled to a drive train (21, 52) connected to said sheet supply apparatus and to said printing cylinders;

and wherein said control means (C) operates in synchronism with rotation of said drive train.

* * * * *

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United States Patent [19]

Ganho

[11] Patent Number: 4,536,218

[45] Date of Patent: Aug. 20, 1985

[54] PROCESS AND COMPOSITIONS FOR LITHOGRAPHIC PRINTING IN MULTIPLE LAYERS

[76] Inventor: Eli A. Ganho, 112 Snidercroft Rd., Unit 8, Concord, Ontario, Canada, L4K 2K1

[21] Appl. No.: 578,556

[22] Filed: Feb. 8, 1984

Foreign Application Priority Data

Feb. 9, 1983 [CA] Canada 421252

[51] Int. Cl.[3] C04B 31/18; C08K 3/08; C09C 1/62; C09D 5/10

[52] U.S. Cl. 106/290; 101/450.1; 101/452; 106/307; 106/310; 106/316; 106/300; 427/258; 428/499; 524/270; 524/271; 524/272; 524/273; 524/274; 524/284; 524/313; 524/441; 524/477; 524/478; 524/764; 524/798; 527/600; 8/2; 8/62

[58] Field of Search 106/290, 300, 307, 310, 106/316; 427/258; 428/499; 524/270-274, 284, 313, 441, 477-478, 764, 798; 527/600

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Primary Examiner—Herbert S. Cockeram
Attorney, Agent, or Firm—Browdy and Neimark

[57] ABSTRACT

Printed materials such as tickets, lottery forms, cards and contest forms, bearing a hidden message which is revealable by scratching off a covering opaque layer, are prepared by printing the message on the substrate, lithographing a protective layer such as a clear varnish or a pigmented varnish-ink over the hidden message, and then lithographing a hiding coat over the applied protective layer. The protective layer formulation and the hiding coat layer are both based upon compatible, preferably the same, film forming resin systems, and are deposited from a common solvent. The protective layer may provide a clear, colorless transparent film through which the message may be viewed, or a colored see-through layer, so that it constitutes one color layer also for the printing of other areas of the substrate.

4 Claims, No Drawings

PROCESS AND COMPOSITIONS FOR LITHOGRAPHIC PRINTING IN MULTIPLE LAYERS

FIELD OF THE INVENTION

This invention relates to printing methods and printing ink compositions. More particularly, it relates to methods and compositions for making sheets such as paper sheets or cards covered with superimposed layers of print, the lower of which comprises a "hidden" message which is masked from a reader unless and until an upper coating is removed, e.g. by abrasion, scratching and erasures.

BACKGROUND OF THE INVENTION

Recently, the preparation and distribution of promotional game cards, premium cards, lottery tickets and the like, containing hidden messages or symbols has become popular and widespread, in fund raising and product promotion. The recipient of such a card must remove from the card a layer of hiding coating in order to reveal a message or symbol. Such items are, however, difficult to prepare and print in an economical fashion, because of the technical specifications they must fulfill.

Such a card bearing a hidden message normally has at least two coating layers overlying a hidden message. Immediately over the message, a transparent or translucent protective layer is provided, through which the message can be read. Over the protective layer, an opaque second layer ("hiding layer") is applied in order to hide the message. The hiding layer can be subsequently stripped away e.g. by scratching etc., to reveal the message through the first coat.

It is necessary that there exists, as between the protective coat or layer and the hiding coat or layer an acceptable degree of adhesion or affinity, so that the hiding coat remains in place and opaque to hide the message during storage, shipping, packaging and transportation of the cards. Nevertheless, the hiding coat ("scratch-off coat") must be readily removable by abrasion by the user at the required time, to render the message visible, leaving the first coat susbtantially unaffected.

Effectively, one must satify two essentially contradictory requirements in the relationship between the varnish coat and the hiding coat, to render them mutually compatible and adhesive to one another at one time, and imcompatible and non-adhesive to one another at another time.

Heretofore, these mutually inconsistent requirements have been satisfied by using a thick hiding coat applied by silk screen methods, over a thin varnish coat applied by lithographic methods or by silk screen methods. In view of its thickness and consistency, the only practical way of applying the hiding coat is by silk screening. This is costly and inconvenient. Lithography is the cheapest, fastest way of printing and applying coatings to such cards. To have to apply one coating by lithography and the other coating by silk screening entails the transfer of the card stock from one printing machine to another, or even the transferring from one printing plant to another printing plant, with consequent added inconvenience, extra expense and loss of security.

SUMMARY OF THE INVENTION

The present invention provides an improved process for preparing printed or coated cards or similar items bearing hidden messages under a layer of protective coat and a layer of hiding coat superimposed thereon. In the process of the present invention, both the protective coat and the hiding coat may be applied to the card lithographically. To facilitate this, the protective coat formulation and the hiding coat formulation are deposited from compatible solvent sysytems and contain mutually compatible resin systems. Then the hiding coat, containing opacifying pigments, can be applied as a thin layer, suitably formulated to be applied by lithography, and still exhibit the necessary hiding power whilst being abrasively removable. In addition, if desired, further printing of patterns can be applied over the hiding coat.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The protective coat formulation and the hiding coat formulation have film-forming resin systems which are mutually compatible. Preferably they comprise generally the same resins or types of resins in both formulations. The protective coat formulation may comprise a pigment free varnish, so as to produce a light coloured translucent or transparent film when dried and cured in place to reveal the message below. Alternatively and preferably however, the protective coat is pigmented with a light coloured pigment so that it may constitute one of the printing colour formulations for application to other areas of the substrate, so as to save one application step in the process. As compared with varnish previously used for this purpose, the protective coat used in the present invention has a higher energy surface, less repellant to and compatible with the pigmented hiding coat. The protective coat formulation contains curatives (hardeners) which will result in the formulation of a hard, cured film, but which is not so hard as to reject the application of the hiding coat. The hiding coat preferably contains the same or similar film forming resin system, but is cured to a lesser degree. The relative degree of cure between the two layers helps to adjust the degree of adhesion between them tending to fulfill the contradictory requirements mentioned above, and permits the scratch-off removal of the hiding coat.

Preferably, the hiding coat contains pigments or opacifying agents which render the finished coat not only visibly opaque but also opaque to all other forms and wavelenghts of radiation also so that the hidden message cannot be prematurely revealed e.g. by x-rays, UV light etc. For this purpose the hiding coat formulation should contain a powdered metal such as powdered aluminum, in addition to regular pigments such as carbon black, dyes etc.

Examples of suitable resins for use in both the protective coat (clear or pigmented varnish-ink formulation) and the hiding coat formulation are phenolic resins such as phenolic modified rosin esters, hydrocarbon resins, alkyd resins such as linseed-isophthalic alkyd and other unsaturated alkyds resins and the like, and mixtures thereof. Such resin systems are curable with heavy metal-organic salt such as manganese octoate and cobalt octoate, to yield the light coloured or transparent films. They can be plasticised if desired, e.g. with waxes of the hydrocarbon type. When a clear varnish is required, the varnish formulation should of course be free from pigments, but may contain other ingredients in minor proportions to modify its surface properties. For example, small amounts of Montan wax, Carnuaba wax or an-

other natural or synthetic wax of similar characteristics, can be added to give a harder surface finish. Such a wax component may in fact migrate to the surface of the coating after curing ("bloom") and then contribute to the surface characteristics of the cured varnish layer. When a pigmented varnish-ink is required, a conventional pigment compatible with the solvent and resin formulation is used therein. The hiding coat formulation should include a drying oil such as refined linseed oil, and smaller amounts of curative, along with opacifying agents, to yield a film of suitable hiding qualities and compatibility with the protective film, yet readily abrasively removable therefrom.

As noted, both the protective layer formulation and the hiding coat formulation should be deposited from compatible solvent sytems, preferably from the same solvent system. Hydrocarbon solvents (e.g. Magie oil, a mixture of aliphatic and aromatic oils) are preferred. The protected layer formulation will normally contain substantially larger proportions of solvent, and hence be of substantially thinner consistency, than the hiding coat formulation. Both formulations are nevertheless of a suitable consistency for application by lithography. The solvent used for the hiding coat should not be capable of penetrating the cured protective layer coat to any significant extent, despite the fact that the very same solvent may well have constituted the vehicle for deposition of the uncured protective layer. Accordingly, a fast drying system is chosen, which cures to a hard finish to prevent solvent and pigment penetration thereof from the hiding coat, but which nevertheless "traps" the subsequently applied hiding coat to the necessary degree.

In order to be satisfactory for lithographic application, an ink formulation must be adjusted in relation to the printing machine speed, to adjust its rate of drying and curing. On a high speed machine, the amount of heat generated by the machine may cure the protective layer formulation to such an extent the the applied layer will not transfer from the plate cylinder to the rubber blanket cylinder and on down the roller train. Accordingly, depending upon the speed and nature of the lithographic printing machine by means of which the protective layer is to be applied, it may be necessary to retard the drying or hardening of the rate of the protective layer as compared with the normal varnishes. This is most commonly encountered when using clear, non-pigmented varnishes in the present invention as the hiding coat. When a slower speed of machine is employed, such retardation may not be necessary.

The following is a preferred general formulation for a clear, non-pigmented varnish for use as the protective layer in the present invention particularly for use with fast running web litho printing machines, with the ingredients expressed as percentages by weight.

Components	% Range
Magie oil (solvent)	30–35
Phenolic modified rosin ester	16–20
Hydrocarbon resin (e.g. of the PICCOPALE* type)	13–17
Linseed-isophthalic alkyd	10–13
Hydrocarbon plasticizer (e.g. of the DUTREX* type)	7–10
Montan wax	3–6
Calcium perborate	1.5–3
Manganese octoate	1.5–2
Cobalt octoate	0.5–1
Gelling agent	0.5–0.7
Chinawood oil	0.3–0.5

*Trade mark

In this formulation, cobalt octoate, manganese octoate and calcium perborate constitute the curing system. The calcium perborate helps to cure the chinawood oil, by supplying oxygen thereto. Similar hydrocarbon flexibilizer may be used in place of DUTREX as the plasticizer. Also similar hydrocarbon rosins may be used in place of PICCOPALE. The chinawood oil (tung oil) is optionally added, to adjust the consistency and tackiness of the surface. The gelling agent also adjusts the consistency of the formulation. As gelling agent, there can be used any suitable product from the reaction of an unsaturated fatty acid, a solvent and calcium octoate. Alternatively, thickener such as fumed silica may be used as or instead of a gelling agent.

For clear varnish application using a slower, sheet fed machine, such a varnish might not result in a coating which would satisfactorily trap the hiding coat. The above formulation would accordingly be modified for example, by reducing or omitting one or more of the gelling agents, calcium perborate, chinawood oil, wax or hydrocarbon resin.

In the preferred process according to the present invention, the card or paper stock is initially printed, in a first colour, with the indica to be subsequently covered with the "scratch-off" hiding coat (the "hidden message") at the appropriate location, lithographically. At the same time and from the same plate, any other areas of the stock may be appropriately printed with the same colour, e.g. with text, picture, design, etc. Normally, the first colour will be the darkest colour to be applied, e.g. black or dark blue. The ink composition used for the first lithographic application step may be of the composition according to the invention, i.e. a varnish-ink, or a standard conventional lithographic ink suited to the base stock.

In the next step of the preferred process, the stock is overprinted lithographically with a second colour, of a varnish-ink according to the invention, at least in the area of the "hidden message", as a solid block covering it. This second colour may be applied wet-on-wet over the first colour. Preferably it is restricted to cover only the area of the "hidden message", but may if desired be used to apply additional text or colour to other areas of the stock. Red is a suitable choice for the second colour. The "hidden message" is still readable through the applied second coat.

There then follow optional steps of lithographic application of additional colour, to complete the printing of the stock. If it is required to produce full-colour printing on the stock, e.g. with full colour illustration, two more colours, e.g. green and yellow, are applied successively, wet-on-wet, over the second colour by lithographic means. Thus a standard four-colour lithographic printing machine can be used. If any of the subsequently applied colours are to cover the "hidden message", then the composition of such colour must be a varnish-ink according to the present invention. It is however preferred to avoid further coating of the "hidden message" with the subsequently applied colours, so that they can be formulated according to standard lithographic ink formulation, compatible with the stock and the previously applied coats. It is however to be empha-

sized that the third and fourth colour applications are optional and not essential to the successful practice of the process of the invention.

After the desired number of colour coats have been thus lithographically applied, the printed stock is allowed to dry, and then the scratch-off hiding coat is applied lithographically to the "hidden message" area. Drying of the colour coats normally takes from 6–24 hours, so that the hiding coat application is conveniently conducted the following day. The hiding coat, for formulation previously described, is lithographically applied over the "hidden message" area, in one, two or three wet-on-wet applications using a standard lithographic plate and printing machine. Then the hiding coat is dried. It is found that the hiding coat successfully adheres to the coating over the "hidden message" so as to render it undecipherable, and is sufficiently adhesive and durable to withstand normal handling and transportation of the printed stock. Nevertheless, it can be readily scratched off, to reveal the "hidden message" through the coating of the second colour.

The varnish-ink formulation is as previously described, merely including a suitable amount of a suitable pigment in addition to the previously mentioned ingredients.

With regard to the curing and the drying of the pigmented varnish-ink, it has additionally been found that the pigmented varnish-ink can be cured in a minimum amount of time. Curing and drying of a pigmented varnish under an infra-red energy source can be completed in as little as 30 minutes. This provides additional time savings for operations of this type.

In order to formulate the pigmented varnish of the present invention, 15–25% of the normal pigment (ink) vehicle usually employed in lithographic printing, is substituted by the varnish identified above. The varnish may be substituted in any colours of ink in order to formulate the pigmented varnish. In this way, a large number of colours may be used to print the message and any other pattern required on the card. A number of layers of differently coloured pigmented varnishes may be applied in sucession, in order to print a multi-coloured pattern and/or message on the card. It is, of course, necessary that in such cases, the colour of the second layer and any additional layer be chosen so as to maintain visibility of the message printed by the first layer.

In formulating the pigmented varnish, the extent of the varnish substitution for normal ink vehicle is dependent on the colour sequence used in the printing process. It is most desirable that the uppermost layer of pigmented varnish contains a higher percentage of the varnish than the lower layers so as to provide optimum communication between the pigmented varnish and the hiding layer.

The following is a preferred general formulation for the pigmented varnish-ink for use in the present invention. The amounts of ingredients are expressed as parts by weight:

Components	% Range
Magie oil (paraffin based solvent)	20–28
Phenolic modified rosin ester	14–18
Hydrocarbon resin (e.g. of the PICCOPALE* type)	8–12
Linseed isophthalic alkyd	6–10
Hydrocarbon plasticizer (e.g. of the DUTREX* type)	6–8
Isophorone diamine	0.5–1.5
Texanol isobutyrate	2–5

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Components	% Range
Montan wax	2–5
Calcium perborate	1–3
Manganese octoate	1–2
Cobalt octoate	0.5–1
Gelling agent	0.3–0.6
Chinawood oil	0.3–0.5
Pigment	16–25

*Trade Marks

It should be noted that the pigmented varnish may also be prepared by mixing known inks of desired colour directly with the varnish. In this case, it will be evident that dilution of the pigment will result. Additional pigment may be added to retrieve the original intensity of the ink, if desired.

Preferably, the hiding coat contains pigments or opacifying agents which render the finished coat not only visibly opaque but also opaque to all other forms and wavelengths of radiation also, so that the "hidden message" cannot be prematurely revealed e.g. by x-rays, UV light etc. For this purpose the the hiding coat formulation should contain a powdered metal such as carbon black, dyes etc.

A suitable such hiding coat is as follows, with the amounts of ingredients expressed as percentages by weight:

Components	% Range
Titanium dioxide	28–35
Aluminum powder	15–20
Phenolic modified rosin ester	15–18
Linseed oil refined	9–11
Black pigment (carbon black)	7–8
Linseed-isophthalic alkyd	5–8
Magie solvent	5–7
Cobalt octoate	0.5–1
Chinawood oil	0.5–1
Hydrocarbon resin	0.5–1
Polyethylene wax	0.3–0.5
Fischer-Tropsch wax	0.2–0.5
Gelling agent	0.5–1

The hiding coat formulations for use in the present invention may be the same as described above or may contain an additional ingredient. It has been found that incorporation of one or more species of long chain fatty amides, of which may be mentioned erucamide, erucyl stearamide and erucyl erucamide, will improve the scratch-off properties of the hiding coat without impairing its integrity during the normal handling and storage. Incorporation of the long chain fatty amides with the above mentioned hiding coat formulation in a preferred range of about 10–20% by weight has been found to provide easier removal thereof by abrasion by the user and improved clarity of the uncovered message.

It will be noted that the above hiding coat formulation has the same basic resin system and solvent as the clear varnish or the pigmented varnish-ink formulation. It differs, however, in the amount of solvent and hence consistency, in the amount of curing system, and in the presence of opacifying agents of those mentioned in the specific formulations. Other suitable unsaturated oils may be used instead of linseed oil, and instead of chinawood oil. The gelling agent is as described in connection with the pigmented varnish-ink coat. The presence of some such unsaturated oil is highly advantageous in providing the best "scratch-off" properties. The lin-

seed-isophthalic alkyd resin in both the formulations is represented of a large variety of available such materials, and substantially any other unsaturated alkyd could be used instead. Isophthalics are preferred however.

The pigmented varnish-ink coat is suitably applied to a printed card stock by sheet fed or web lithograph methods. The aforementioned formulations are most suitable for sheet fed lithography. The consistency of the formulations needs adjustment to render them more suitable for web lithography.

The pigmented varnish-ink layers, suitably 2-4 in number, wherein each layer may be the same or a different colour, may be applied wet-on-wet, i.e. without waiting for the previously applied layer of pigmented varnish to dry and cure. The total pigmented varnish coat must however, as mentioned, be dried and cured before the hiding coat is applied. Then the hiding coat is also suitably applied to the stock, over the pigmented varnish, in one or several wet-on-wet layers, and then allowed to dry and cure.

The resulting hiding coat is durable not only to withstand normal storage and handling, but also to receive further overprintings and additional hiding layers, patterns or printed information, should this be required. The scratch-off portion can be readily removed by the user's fingernails, without abrasives, coins, files, erasers or the like, to show clearly the overprinted "hidden message".

The invention is further illustrated in the following specific examples.

EXAMPLE

The following specific pigmented varnish-ink formulation (a red ink) and hiding coat formulation were made up, with ingredients listed as weight percentages:

Red Varnish-Ink Formulation

Components	%
Magie oil (paraffin based solvent)	25
Phenolic modified rosin ester	15
Hydrocarbon resin (e.g. of the PICCOPALE* type)	14
Linseed isophthalic alkyd	8
Hydrocarbon plasticizer (e g. of the DUTREX* type)	6
Isophorone diamine	1
Texanol isobutyrate	4
Montan wax	3
Calcium perborate	2.2
Manganese octoate	0.3
Cobalt octoate	0.5
Gelling agent	0.5
Chinawood oil	0.5
Pigment (Permanent Carmine FBB02 (CI, 12485)	20

*Trade Marks

Hiding Coat Formulation

Components	%
Titanium dioxide (TIOXIDE*)	32
Aluminium powder	18
Phenolic modified rosin ester	16
Linseed oil refined	10
Black pigment (carbon black)	8
Linseed Isophthalic alkyd	5
Magie solvent	6
Cobalt octoate	0.6
Chinawood oil	0.6
hydrocarbon resin (PICCAPOLE* Type)	1
Polyethylene wax	0.3
Fischer-Tropsch wax	0.3

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Hiding Coat Formulation

Components	%
Gelling agent	0 6

*Trade Marks

The red varnish-ink formulation was applied, by sheet fed lithographically using a standard printing machine, to a card stock bearing indicia previously printed with a standard black ink known for use in lithographic printing. The card contained an area with a printed message which was to be hidden. The carmine pigmented-ink formulation was applied lithographically over the message area such that the entire message was covered by a solid rectangular block of the red varnish-ink. The message was clearly visible and legible through the red varnish-ink coat. The applied red varnish-ink coat was allowed to dry and cure for one way.

Next, using the same sheet fed lithographic printing machine, the hiding coat was applied directly over the cured varnish-ink coat. Four layers were applied, wet on wet, and then the hiding coat was allowed to dry.

The hiding coat so formed completely obliterated the underlying message. It was durable enough to withstand normal handling and packaging. Nevertheless, it was removable by scratching with a fingernail, to reveal the varnish coat substantially unaffected, through which the printed message was clearly visible.

EXAMPLE 2

By replacing the carmine pigment component in the varnish-ink formulation of example 1, black pigmented, yellow pigmented, and blue pigmented varnish-ink were prepared. The carmine varnish-ink was also prepared as per example 1.

Using the black-pigmented varnish-ink, a first layer was printed on a black substrate by a sheet-fed lithographic press having four printing stations in serial arrangement. This first black layer marked characters on the blank substrate including the indicia which were to be hidden, i.e. the "message".

The indicia-bearing substrate was passed, while still "wet" to a second pressing station on the same lithographic press where the carmine pigmented varnish-ink was applied such that the entire area encompassing the message was covered or "masked" by the carmine ink-varnish. Other areas were printed on the substrate at this same, station and with the same carmine pigmented varnish-ink in this printing step in order to add colour to the characters on the card outside the area containing the message. The masking provides a surface over the message which enables the hiding layer to be reversibly trapped within the area of the masking. The message was clearly visible and legible through the carmine layer.

A third layer of yellow-pigmented varnish-ink was then applied at the next station on the same lithographic press to the substrate on areas outside of the message area. This additional layer served to add colour to the characters on the face of the card.

To provide an even more colourful card the substrate was passed from the yellow-pigmented printing station to the fourth and final printing station on the press where the blue-pigmented varnish-ink was appropriately layered on areas outside the message area.

Although it is within the scope of the invention to apply either or both of the yellow and blue-pigmented

varnishes into the masked area at the subsequent printing stations it will be realized that, since the carmine layer i.e. the first masking layer will fulfill the aforementioned requirements of releasably trapping the hiding layer, savings on ink consumed in the printing process can be obtained by omitting the application of more than one blocking layer.

After the final fourth layer was printed, the substrate was removed and allowed to cure until the next day. Means for reducing the curing time can be used to accelerate the curing process, if desired, such as an infra red energy source, etc.

The substrate with the cured varnish-ink layers was then introduced into a lithographic press having, again, four printing stations, each of which contained a hiding coat formulation as exemplified in example 1. The hiding coat was applied directly over the carmine pigmented area blocking the message at each successive station.

The layers were applied wet-on-wet. After passing through the press the card was removed and allowed to dry.

The following day, it was found that the hiding coat layer was completely removeable to reveal the hidden message by scratching with a fingernail.

EXAMPLE 3

The following specific varnish-formulation and the hiding coat formulation of example 1 were made up, with ingredients listed as weight percentages:

VARNISH	
Components	%
Magie oil (solvent)	32
Phenolic modified rosin ester	18
Hydrocarbon resin (e.g. of the PICCOPALE* type)	16
Linseed isophtholic alkyd	10
Hydrocarbon plasticizer (e.g of the DUTREX* type)	8
Montan wax	3.5
Calcium perborate	2.2
Manganese octoate	
Cobalt octoate	0.7
Gelling agent	0.5
Chinawood oil	0.7

*Trade Mark

The varnish formulation was applied, by sheet fed lithography using a standard printing machine, to a card stock previously printed with a message to be hidden. Three layers of applied varnish were applied successively, wet-on-wet and then the applied varnish was allowed to dry and cure. A light coloured, transparent film was formed, through which the underlying printed message was clearly visible and legible.

Next, using the same sheet fed lithographic printing machine, the hiding coat was applied over the cured varnish coat. Four layers were applied, wet-on-wet, and then the hiding coat was allowed to dry.

The hiding coat so formed completely obliterated the underlying message. It was durable enough to withstand normal handling and packaging. Nevertheless, it was removable by scratching with a fingernail to reveal the varnish coat substantially unaffected, through which the printed message was clearly visible.

Whilst according to the invention, it is preferred to apply the varnish-ink coat and the hiding coat lithographically, it is nevertheless possible to apply the varnish-ink coat by letterpress application and the hiding coat lithographically, thus retaining the principle advantage, of avoiding silk screen application. In such case, the hydrocarbon resin component is omitted from the varnish-ink formulation.

I claim:

1. A varnish composition suitable for lithographic application to a substrate to cover indicia printed thereon preparatory to hiding said indicia with an abrasively removable hiding coat, said composition including the following ingredients in the following approximate weight range:

Components	% Range
Magie oil (solvent)	30–35
Phenolic modified rosin ester	16–20
Hydrocarbon resin	13–17
Linseed-[isophtholic] isophthalic alkyd	10–13
Hydrocarbon plasticizer	7–10
Montan wax	3–6
Calcium perborate	1.5–3
Maganese octoate	1.5–2
Cobalt octoate	0.5–1
Gelling agent	0.5–0.7
Chinawood oil	0.3–0.5

2. A pigmented varnish-ink composition suitable for lithographic application to a substrate to cover indicia printed thereon preparatory to hiding said indicia with an abrasively removable hiding coat, said composition including the following ingredients in the following approximate weight range:

Components	% Range
Magie oil (paraffin based solvent)	20–28
Phenolic modified rosin ester	14–18
Hydrocarbon resin	8–12
Linseed-isophthalic alkyd	6–10
Hydrocarbon plasticizer	6–8
Montan wax	2–5
Calcium perborate	1–3
Manganese octoate	1–2
Cobalt octoate	0.5–1
Gelling agent	0.3–0.5
Chinawood oil	0.3–0.5
Pigment	16–25

3. A hiding coat composition suitable for lithographic application over a cured varnish coating as claimed in claim 1, and including the following ingredients in the following approximate weight ranges:

Components	% Range
Titanium dioxide	28–35
Aluminum powder	15–20
Phenolic modified rosin ester	15–18
Linseed oil refined	9–11
Black pigment (carbon black)	7–8
Linseed-isophthalic alkyd	5–8
Magie solvent	5–7
Cobalt octoate	0.5–1
Chinawood oil	0.5–1
Hydrocarbon resin	0.5–1
Polyethylene wax	0.3–0.5
Fischer-Tropsch wax	0.2–0.5
Gelling agent	0.5–1

4. A hiding coat suitable for lithographic application over a cured pigmented varnish-ink composition according to claim 2, and including the following ingredients in the following approximate weight range:

Components	% Range
Titanium dioxide	28–35
Aluminum powder	15–20
Phenolic modified rosin ester	15–18
Linseed oil refined	9–11
Black pigment (carbon black)	7–8
Linseed-isophthalic alkyd	5–8
Magie solvent	5–7
Cobalt octoate	0.5–1
Chinawood oil	0.5–1
Hydrocarbon resin	0.5–1
Polyethylene wax	0.3–0.5
Fischer-Tropsch wax	0.2–0.5
Gelling agent	0.5–1

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United States Patent [19]

Sarazen

[11] **Patent Number: 4,796,528**

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[54] **SEPARATED INK FOUNTAIN FOR A FLEXOGRAPHIC PRINTING MACHINE**

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[52] **U.S. Cl.** **101/208**; 101/211

[58] **Field of Search** 101/207, 208, 209, 210, 101/350, 364, 363

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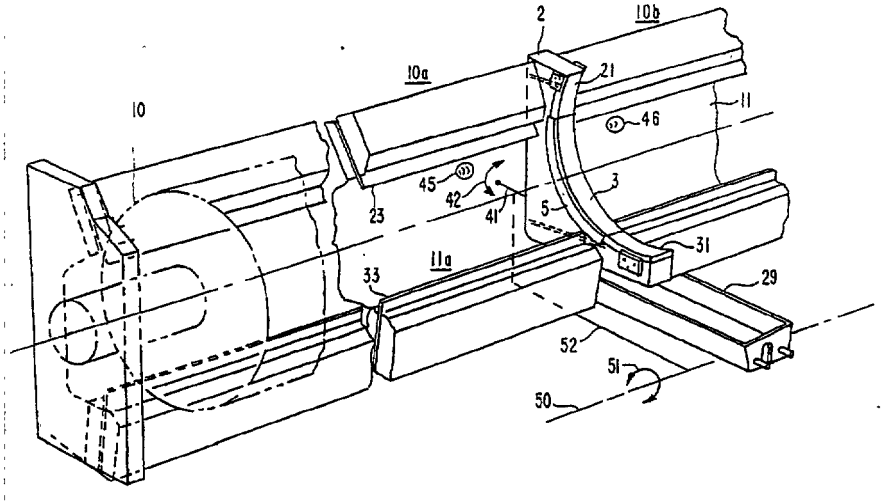
[57] **ABSTRACT**

To separate a flexographic ink fountain into axial zones (**10a, 10b** . . .) to permit use of inks of different characteristics, for example different colors along axial zones of an anilox roller (**10**), a separator element (**2**) has an insert strip element (**3**) extending over a portion of the circumference of the anilox roller, and resiliently engaged thereagainst, for example by compressed silicone rubber (**5**). Adjacent the end of the strip element (**5**) are two felt pads (**21, 31**) which are supplied from a source of separating fluids, such as water, alcohol-water solution or the like, to apply a ring-shaped film of the separating liquid on the anilox roller which film will continue beneath the separating strip (**3**), the separating strip being engaged against the roller with sufficient pressure to permit the strip to ride on the liquid film, similar to planing of autombile tires on a wet road surface. Two doctor blades are located on a trough structure, selectively moveable away from engagement with the surface of the anilox roller in dependence on rotation of the anilox roller. Additionally, the doctor blades (**23, 33**) can both be spaced from the surface of the anilox roller by a distance just sufficient to clear the anilox roller (**10**) thus permitting continued operation of the anilox roller when not in use under idling speed conditions, and preventing drying of ink on the anilox roller. When the doctor blades are removed from the anilox roller, the compressible material, and expansion of the felt pad retains the separating film of liquid on the anilox roller, thus saving "wash up" between extended periods when the machine is not printing, while conserving the surface of the anilox roller and the edges of the doctor blades.

19 Claims, 2 Drawing Sheets



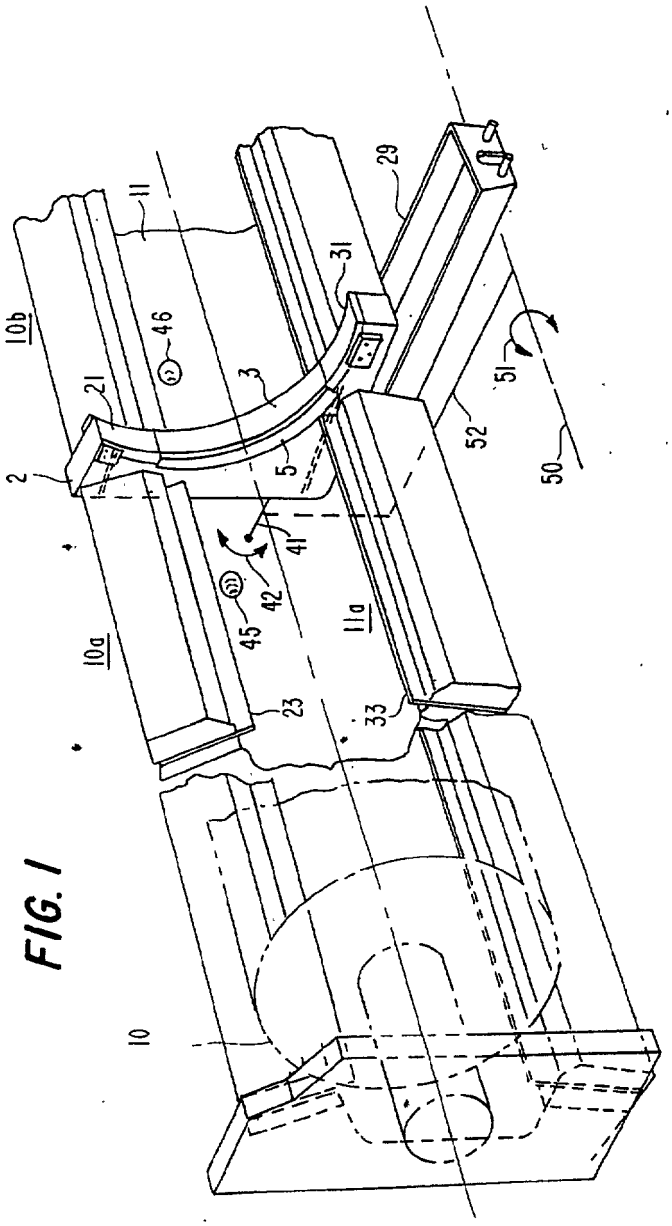


FIG. 1

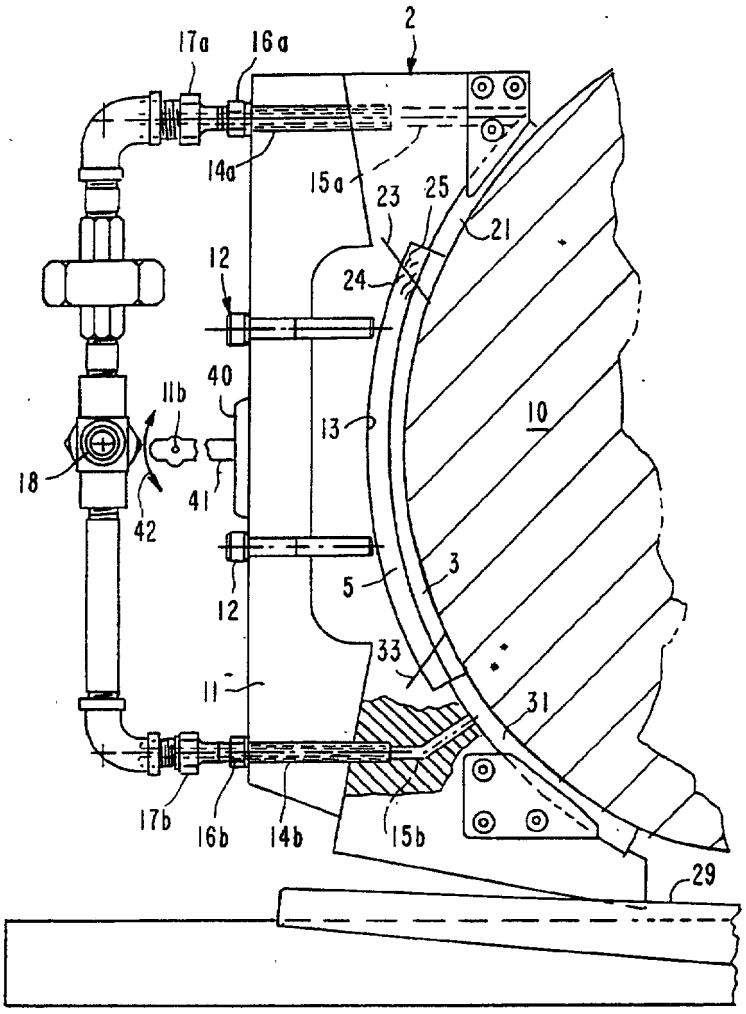

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FIG. 2

SEPARATED INK FOUNTAIN FOR A FLEXOGRAPHIC PRINTING MACHINE

The present invention relates to printing machines and more particularly to flexographic printing machines, and especially to an ink system or ink fountain therefore, in which the ink fountain is subdivided into axially different zones to permit application of inks of different colors in the respective zones to corresponding zones on an application, or anilox roller.

BACKGROUND

Flexographic printing machines are increasingly used in the printing field. Usually, flexographic printing machines were used to print on bags, wrappers, cartons and boxes. Recently, flexographic printing is being used outside of the packaging field, particularly for books, magazines, stationery and the like A good discussion of flexographic printing is found in "Machine Printing" by Durrant, Meacock and Whitworth, copyright 1973 by Hastings House Publishers, New York, N.Y.

It has previously been proposed to separate inks of different characteristics, for example of different colors with respect to actual zones on an ink ductor roller against which at least one and usually two doctor blades are engaged, see, for exam U.S. application, Ser. No. 921,338, filed Oct. 21, 1986, now U.S. Pat. No. 4,754,701 Batke et al. This application is directed to a system in which a separating plate is located beneath an axially extending doctor blade. The separating plate has a sealing element attached thereto, resiliently engaging the underside of two doctor blades facing the ductor or trough roller from different directions to permit operation of the ductor or trough roller in either direction of rotation. A low friction surface is applied to the edge which faces the doctor blades, the sealing elements spanning the space between the doctor blades and being matched to the circumference of the ductor or trough roller. The doctor blades extend axially beyond the sealing elements. The separating plates and sealing elements can be mounted on units which are actually positioned along on ink trough and hence the ductor or trough roller, at selected positions, as required by the axial extent of different colored inking zones.

German Patent Disclosure Document DE-OS No. 23 20 638, referred to in the aforementioned Batke patent application, describes an arrangement in which two ink separating sheet metal elements are engaged by spring force directly to the circumference of a ductor roller in order to separate differently colored inks from each other. The lateral sealing of the ink reservoir or ink sump region is obtained by engaging the separating elements against the faced surface of the doctor blades or stripper blades.

THE INVENTION

It is an object to provide a flexible arrangement to separate axial zones on an anilox roller for a flexographic printing machine so that inks of different characteristics, for example of different color can be supplied to the respective zones, without overlap; which is simple, inexpensive and provides for effective sealing of the axial zones with respect to each other.

Briefly, a separating strip element preferably having a low friction surface has a curved surface fitting against and matching the surface of the anilox roller. The curved surface extends over a portion of the circumference thereof. To positively separate the inks of different characteristics, thus preventing migration of ink between the two or more ink zones and to eliminate the effect of abrasion in the water based flexographic inks, a thin film of a hydraulic separating liquid is placed between the strip element and the surface of the anilox roller. Typically,the strip element is made of "Teflon" ®, and the separating liquid is water. Other separating liquids, like water-alcohol mixtures, or ink solvents may be used. The liquid film applied to the region beneath the strip by placing two liquid saturable elements adjacent the end portions of the strip elements. Felt is a preferred material; other spongy materials can be used. Liquid is introduced to the felt elements, which will operate as wicks, to place the thin liquid film just in the region of the separating strip. "Teflon" is a polytetrafluoroethylene plastic.

In accordance with the preferred feature of the invention, the strip element is backed by silicone rubber, for example, of the low durameter type. This permits the seal to become self aligning regardless of direction of rotation of the anilox roller.

Anilox rollers are customarily used with doctor blades. In accordance with the feature of the invention, the doctor blades are cut, or made such that they terminate at the separating elements. The rubber back up permits sealing the corners of the doctor blade inside the ink chambers adjacent to the ink separators, and thus effectively seals the edges of the doctor blades as well, by plastic deformation of the silicone rubber, that is, bulging over the edge upon application of pressure.

In accordance with another feature of the invention, the fountain system is so arranged that a holder structure for the separating strip element, the back-up rubber, and the felt pads or, preferably, the entire ink fountain can be moved for selective engagement of either one of the doctor blades with the anilox roller, in dependence on the direction of rotation of the anilox roller and, further, so moved that both doctor blades clear the anilox roller, while the separating element and preferably also the pads remain in engagement with the surface of the anilox roller. This has the advantage that, during non-printing periods, the anilox roller can be permitted to continue to rotate, with ink being circulated in the ink fountain, thereby preventing drying of the ink on the anilox roller without, however, engaging one of the doctor blades with the anilox roller thereby substantially reducing wear and tear on both the anilox roller as well as the respective doctor blade or blades.

DRAWINGS

FIG. 1 is a general perspective view of a flexographic inker,(wherein the anilox roller is shown in phantom), subdivided axially, in accordance with the present invention;

FIG. 2 is a schematic axial cross sectional view through an anilox roller and showing the ink separator in accordance with the present invention.

DETAILED DESCRIPTION

An anilox roller **10**, of standard construction, and for example of about 28 cm diameter (about 11") is separated into axial zones, corresponding to axial zones **10***a*, **10***b*, or more, in dependence on requirements of the fountain. A separator element **2**, for example of plastic—nylon being suitable—is retained in a suitable portion of the ink fountain, shown only schematically at **11** by screws **12**. Fountain **11**, defining an ink cavity **11***a* is

retained on the machine frame as well known. It can pivot slightly about an axis **11***b* (FIG. 2) perpendicular to the plane of FIG. 2. The separator element is narrow, and extends over a portion of the circumference of the anilox roller **10**. separator element **2** is formed with a cutout **13** into which a "Teflon"seal **3**, backed up a silicone rubber back-up element **5** is placed. For newspaper printing, a width of the elements **3, 5** of about 15 mm is suitable.

The silicone rubber back-up element **5** uniformly distributes the pressure of the "Teflon" separator strip **3** about the circumference of the anilox roller. Compressive force of the silicone rubber can be obtained by pressure against the anilox roller **10**. Thus, the pressure of the separator strip **3** against the anilox roller can be controlled.

In accordance of the feature of the invention, a thin film of liquid, typically water, is applied between the anilox roller **10** and the "Teflon" separator strip **3**. This thin film of water is derived from two felt pads **21, 31,** which are supplied with water from a water supply duct system. The water supply duct system is formed by a hollow bolts **14***a*, **14***b*, which, are threaded into the separating element **2**, and communicate with ducts **15***a*, **15***b* formed in the separating element and terminating at the felt strips **21, 31**, respectively. The shapes of the ducts can be matched to any suitable requirement, for example straight, as shown at **15***a*, or angled or bent as shown at **15***b*. A water trough **29**, located beneath the entire assembly, receives any excess or dripping water.

The bolts **14***a*, **14***b* are threaded at the outside, and nuts **16***a* **16***b* though not necessary, may be used to retain the bolts against the frame **11**. The bolts **14***a*, **14***b* are coupled by suitable hydraulic coupling **17***a*, **17***b* to a hydraulic supply line, shown schematically and including such common hydraulic elements as elbows, unions and the like, as well as, valves **18***a*, **18***b*. Water then can be supplied selectively to the respective felt strips **21, 31**. The felt strips **21, 31** are held in position on the separator element **2** by retaining plates **22, 32,** which engage the felt strips **21, 31**, from both lateral sides; only one of the clamping plates **22, 32**, is visible in FIG. **2**.

Doctor blades **23, 33** are selectively engaged with the surface of the anilox roller, and extend axially, that is, perpendicular to the plane of the drawing of FIG. **2**. They are secured in position in the fountain. To provide for selective engagement of the doctor blades **23, 33** in dependence on roller rotation, the fountain is pivoted about pivot axis **11***b*. The doctor blades can be pressed axially into the silicone rubber back-up **5**, which will slightly compress and bulge around the doctor blade as schematically shown at **23, 24**, thus providing a tight seal thereagainst. Preferably, the "Teflon" strip **3** is formed with sharp corners. The "Teflon" strip **3** and the silicone rubber back-up **5** can be seated in the recess **13** by being adhered therein, for example by a pressure sensitive adhesive.

The water ducts through the bolts **14***a*, **14***b*, and the connecting ducts **15***a*, **15***b* through the separator element **2** can be quite small, for example about two to three mm in diameter, just enough to drip water to the pads **21, 31**, so that a hydraulic film will form beneath the "Teflon" ® strip **3**, to separate adjacent axial zones **10***a*, **10***b* . . . . and corresponding zones on the anilox roller. The circumferential length of the felt strips, for a roller of about 28 cm diameter can be about 7 to 8 cm.

Applying a thin film of water between the "Teflon" strip **3** and the surface of the anilox roller **10** has the advantage that the separator strip will not damage the anilox roller and provide a seal with an extended life span which, additionally, is not affected by high rotational speed of the anilox roller **10**. Using water as a film liquid has an additional advantage because it prevents drying of flexographic ink on the anilox roller in the region of ink separation, thus eliminating the abrasive characteristics of water based inks, which otherwise cause wear of sealing material due to build up of dry ink on the anilox roller.

The amount and direction of water flow to be used can readily be controlled by operation of a three way valve **18** in the water supply system to the ducts **15***a*, **15***b*. The quantity can be easily determined by experimentation; just enough water should be used so that the ink separator region does not dry or harden on the anilox roller. Besides the interaction of the water film with the ink, the water will additionally act as a lubricant, and form a hydraulic film around the circumference of the anilox roller. Thus, the "Teflon" strip **3** will ride on the film, and even though the pressure may be considerable, the effect will be similar to that of planing of rolling automobile tires on a road surface which is wetted. This hydraulic film effectively eliminates friction, and prolongs the life of the seal. Just as in planing of automotive tires on a road surface, the friction is low.

Ink migration across the separator is effectively inhibited since the hydraulic film permits liquid to remain only between the anilox roller and the "Teflon" seal, and, in turn, prevents the entrance of ink between the "Teflon" seal and the anilox roller. Thus, migration of ink of one c[characteristic, for example, of one color to ink of another characteristic, for example, of another color is effectively prevented.

Use of a separate rubber back-up **5** is not strictly necessary but preferred. It permits ready replacement and provides uniform even sealing pressure. A low durometer material, for example, a closed silicone rubber of **30** durometer, and located behind the "Teflon" sealing strip provides uniform, even sealing pressure against the face of the anilox roller. The low durometer silicone rubber between the wall of the separating element **2** and the "Teflon" seal also provides for effective sealing of the corners of the doctor blades. This type of silicone rubber permits about 20% compression, which causes the slight side expansion **24,25** of the silicone rubber around the blade ends and corners.

Various materials can be used to form the water film application elements **21, 31**; felt is particularly suitable since it permits a metered dripping or application of water through the separator strip **3**. The water comes with the felt pads **21,31** located above and below the "Teflon" seal. The density of felt is such that an even distribution of water is obtained. The water seeps to the lower portion of the felt pads by gravity.

The arrangement has the additional advantage of low cost. Teflon is substantially more expensive silicone rubber or felt, and using a thin small strip of "Teflon" backed up by silicone rubber with felt pads on either side reduces the amount of "Teflon" used. The "Teflone" is only used in the areas of the ink fountain, between the upper and lower doctor blades.

In accordance with the feature of the invention, the entire ink fountain **11**, together with the separator element **2**, the strip element **3** the back-up element **5** thereof and the doctor blades **23, 33** can be pivoted about the axis **11***b*. The fountain **11** is retained on the machine frame by a bracket **40**, coupled to a holder rod

41 which can be pivoted about the pivot axis 11*b*, as shown schematically by arrow 42. The holder rod 41 is shown broken since the pivot axis 11*b* is usually further toward the left—with respect to FIG. 2—and would not normally be visible in the drawing, for example, being hidden by the valve 18. The location in FIG. 2 has been selected only for clarity of illustration. The fountain 11 is usually trough shaped, to define the ink cavity 11*a*. Ink is continously admitted to the ink cavity by inlet openings 45, and removed by outlet openings 46, ink being continuously circulated in the ink cavity. The anilox roller 10, engaged or just slightly spaced from the doctor blades 23, 33 prevents loss of ink.

In accordance with the feature of the invention, the ink fountain 11 can be removed with respect to the anilox roller 10 such that both doctor blades 23, 33 lose contact with the anilox roller 10. The movement is slight, a fraction of a millimeter. This permits continued circulation of flexographic ink in the ink trough 11*a*, and rotation of the anilox roller 10 at low or idle speed, thereby preventing drying of ink on the roller 10 during periods of time when printing is not being effected, while maintaining separation of inks of different colors, for example, in the different zones 10*a*, 10*b*. The strip, element 3 as well as the pads 21, 31 will expand slightly—after having been compressed—but not sufficient to lose contact with the anilox roller; if one, or both of the pads 21, 31, should lose contact over a portion of the surface, little harm is done; sufficient water will be applied to form a ring-shaped liquid film in alignment with strip 3 around the anilox roller 10 so that the strip 3 will ride, or plane on the ring-shaped film, thereby continuously preventing ink from the zones 10*a*, 10*b* from merging or bleeding over each other while still permitting rotation of the anilox roller, while it remains positioned in front of the ink cavity 11*a*. The movement of the ink trough so that the doctor blades 23, 33 clear—that is, just barely clear the roller 10, while permitting the back-up rubber 5 as well as the pads 21, 31 to expand can be obtained in any suitable manner; as shown in FIG. 1, a common shaft 50 extends longitudinally of the inker, parallel to the ink trough 11. It can be pivoted as shown by arrow 51. Shaft 50 is coupled by an angled lever 52 to the support rod 41, or the bracket 40, respectively of the separator element 2 tilt mechanism.

OPERATION

If the anilox roller 10 operates in clockwise, or forward rotation, the upper felt pad should be removed, and the upper drip system shut off, for example, by turning valve 18 to direct water to lower pad 31. The lower felt pad 31 remains in place and the lower drip or water application system is activated by valve 18 By wick action, pad 31 will apply a thin film of water on roller 10 which will permit strip 3 to ride on the film. Upon rotation of roller 10, a ring of water film will form on the roller 10, separating adjacent zones of ink. Fountain 11 is pivoted about axis 11*b*, see arrow 42, to disengage doctor blade 23. Rubber backing 5 will equalize engagement pressure of strip 3 against roller 10. Upon reversing rotation to counter clockwise or reverse anilox rotation, the lower drip system can be turned off by changing position of valve 18 and the lower felt pad 31 can be removed. The upper felt pad 21 remains in place and the upper drip system is activated. The non-wetted felt pads should be removed to prevent drying. Removal of the felt pad is simple, by merely slipping them out, possibly also loosening holding screws holding the respective clamping plate 22, 32, and then removing the respective felt strips 21, 31.

Under normal printing conditions, 10 may operate at speeds of up to about 800 rpm, for example. If the machine is not printing it has been customary to stop ink flow and engage in a "wash up", to prevent drying of the rapidly evaporating ink on the anilox roller 10 and in the fountain. In accordance with the feature of the present invention, however, the roller 10 can be permitted to continue to operate at idle speed, for example, at about 30 rpm, with ink continuously being circulated between inlets 45 and outlets 46—shown in FIG. 1 only in different ink zones—while separating the ink zones from each other. Upon tilting of shaft 50 in counterclock wise direction of arrow 51, both doctor blades 23 and 33 will be removed from engagement with the anilox roller 10. The tilt axis of shaft 50 is preferably in essential vertical alignment with the axis of rotation of anilox roller 10, and, for example, somewhat below the ink trough 29. The normal compression of the rubber backing 5, when printing, may be about 25% of its nominal., uncompressed thickness; that of the felt pads about 10%. Slightly tilting the fountain 11 permits some expansion of the rubber liner backing 5; and of the felt pads 21, 31, without loss of their function however. Thus, wash up can be eliminated during idling periods; the strip element 3 and the pads 21, 31 will remain in engagement with the roller 10, thus separating ink zones, while preserving the edges the doctor blades 23, 33 and the surface of the anilox roller.

Various changes and modifications may be made within the scope of the inventive concept.

I claim:

1. In a flexographic printing machine,
an arrangement to separate an ink fountain (11) into different axial zones (10*a*, 10*b*) to permit use of inks of respectively different characteristics on various zones of an anilox roller (10) comprising
a separating strip element (3)
and means (21, 14*a*, 15*a*; 31, 14*b*, 15*b*; 18) for introducing a hydraulic film of a separating liquid between the surface of the strip element (3) and the surface of the anilox roller (10), including a pad element (21, 31) of a porous substance, positioned in alignment with said separating strip element (3);
liquid supply means (14*a*, 15*a*; 14*b*, 15*b*) in hydraulic fluid communication with said pad element (21, 31) of the porous substance; and
the separating strip element (3) having a curved low-friction surface fitting against and matching the surface of the anilox roller (10), positioned, with respect to the direction of rotation of the anilox roller, downstream from said pad element (21, 31), and extending over a portion of the circumference of the anilox roller,
the hydraulic film forming a ring of liquid essentially only in the circumferential region of the anilox roller which includes said portion of the circumference thereof, to float the separating strip element (3) on said ring of separating liquid.

2. The arrangement according to claim 1 wherein said separating liquid comprises water.

3. An arrangement in accordance with claim 2 wherein two pad elements (21,31) and two liquid supply means are provided, the respective pad elements being located adjacent extreme ends of said separating strip element (3).

4. An arrangement in accordance with claim 2 wherein said pad element of porous substance comprise felt means.

5. An arrangement in accordance with claim 1 further comprising a back-up element (5) located adjacent the separating strip element (3) at a side thereof remote from said anilox roller (10), said, back-up element comprising a compressible material.

6. An arrangement in accordance with claim 5 wherein said compressible material comprises silicone rubber.

7. An arrangement in accordance with claim 5 further including a separator element (2) defining a holder structure, said holder structure being formed with a recess (13) extending part circumferentially around said anilox roller, said back-up element (5) being retained in said recess;

and adjustable means (12, 16*a*, 16*b*) adjustably engaging the separator element to provide an essentially radially directed force against said back-up element and to compress said compressible material and press the separator element (3) against the surface of the anilox roller (10).

8. An arrangement in accordance with claim 5 further including doctor blade means (23, 33) having an axial length extending up to the separator element, said doctor blade means (23, 33) engaging with an edge portion against said back-up element (5) of compressible material to permit the compressible material to bulge out against the doctor blade means and seal the edge of the doctor blade means.

9. An arrangement in accordance with claim 1 further comprising a separator element (2) defining a holder structure;

resilient support means (5) for resiliently supporting said strip element (3) on the holder structure for essentially uniform part-circular resilient engagement of the strip element with the anilox roller (10);

doctor blade means (23, 33) located on the ink fountain (11); and

means (41, 42; 50, 51, 52;) movably supporting the ink fountain for selective engagement with the doctor blade means with the anilox roller, or disengagement of the doctor blade means by a slight distance sufficient to clear the doctor blade means from the anilox roller while retaining resilient engagement of the strip element (3) with the anilox roller (10) and continued application of separating liquid to he anilox roller by said liquid application means.

10. An arrangement in accordance with claim 9 wherein said means for introducing the hydraulic film of the separating liquid comprises two wick-type pad elements (21, 31) of a porous substance, positioned in alignment with said strip element (3) at extreme ends of the strip elements;

two doctor blades are provided, forming said doctor blade means, a first doctor blade being associated with the anilox roller in one direction of rotation, and a second doctor blade being associated with the anilox roller in reverse direction of rotation;

and wherein the movable support means permits selective engagement with the anilox roller of

(a) the first doctor blade;

(b) the second doctor blade; and

(c) neither doctor blade,

while maintaining the anilox roller (10) in fluid transfer position with at least one of said pad elements (21, 31).

11. The arrangement of claim 1 wherein said separating liquid comprises at least one of water; water-alcohol mixtures; ink solvents.

12. In a flexographic printing machine, an ink fountain (11) including an arrangement to separate the fountain into different axial zones (10*a*, 10*b* . . .) to apply ink on an anilox roller (10) in different axial zones thereof and to permit use of inks of respectively different characteristics, for example of different colors, in the various zones

comprising

a separator (2) having a surface facing the anilox roller (10) which extends over a portion of the circumference thereof; said separator including

a separating strip element (3) having a curved surface of low friction material fitting against and matching the surface of the anilox roller;

a back-up means (5) of compressible material secured to said separator element, and retaining said separating strip element (3) in position, extending over a portion of the circumferential dimension of said separator element (2);

a pad element (21, 31) of a fluid pervious, porous substance retained on said separator element (2) adjacent the end portions of the separating strip element (3) and extending away from the end portions of the separating strip element;

fluid supply means (14*a*, 15*a*; 14*b*, 15*b*; 18) connecting a source of separating fluid to said pad element to apply a separating fluid thereto, and, in turn, form a film of separating fluid on the surface of the anilox roller (10) and between the surface of the anilox roller (10) and the separating strip element (3);

and means (12, 41, 42; 50, 51, 52) for engaging the separator element (2) towards the surface of the anilox roller (10).

13. The arrangement of claim 12 wherein said separating strip element comprises polytetrafluoroethylene; said back-up means comprises silicone rubber; and said pad element comprises a felt pad.

14. The arrangement of claim 12 wherein said separator (2) defines a holder structure;

two pad elements are provided, one each located at an extreme end of the separating strip element;

two doctor blades are provided, a first doctor blade (23) being associated with one direction of rotation of the anilox roller (10) and a second doctor blade (33) being associated with reverse direction of rotation of the anilox roller,

said doctor blades being secured to said ink fountain;

and wherein the engagement means for engaging the separator against the surface of the anilox roller include means (41, 42; 50, 51 52) for movably supporting the ink fountain for selective engagement of either one of said doctor blades with the anilox roller in dependence on the respective direction of rotation of the anilox roller, or disengagement of both doctor blades with the surface of the anilox roller by separating edges of the doctor blades from the surface of the anilox roller by a slight distance to clear the anilox roller while retaining resilient engagement of the separating strip element (3) with the anilox roller and of at least one of said pad elements with the anilox roller to continuously apply separating fluids to the anilox roller and form said film of separating fluid between the surface of the anilox roller and the surface of the separating strip element.

15. The arrangement of claim 12, wherein said separating liquid comprises at least one of: water; water-alcohol mixtures; ink solvents.

16. A method of sealing flexographic printing inks or different colors from each other and separating said inks in axial zones of an anilox roller (10) comprising the steps of:

providing a separating strip element (3) having a low-friction surface which is curved, matches the surface of the anilox roller (10), and extends over a portion of the circumference thereof;

forming a circumferential ring of a film of separating liquid between said zones by applying a porous wick-like pad against the surface of the anilox roller and saturation said pad with said liquid;

resiliently engaging said separating strip element against said ring of the film of separating liquid;

floating said separating element on said film; and

said step of forming the circumferential ring of the film of separating liquid comprises

introducing just enough liquid upstream, in the direction of rotation of the anilox roller, to provide for effectively planing of the separating strip over the film of liquid.

17. Method according to claim 16 wherein said liquid comprises water.

18. Method according to claim 16 for use in a flexographic printing machine having two doctor blades (23, 33) selectively engagable with the anilox roller (10), or separable therefrom,

wherein the step of introducing said film of liquid comprises maintaining said film of liquid on the anilox roller and continuing to float the separating element on said film when the doctor blades are separated from the anilox roller.

19. Method according to claim 16 wherein said separating liquid comprises at least one of: water; water alcohol mixtures; ink solvents.

* * * * *

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US005189960A

United States Patent [19]

Valentini et al.

[11] Patent Number: 5,189,960

[45] Date of Patent: Mar. 2, 1993

[54] **APPARATUS AND METHOD FOR CONTROLLING TEMPERATURE OF PRINTING PLATE ON CYLINDER IN ROTARY PRESS**

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[21] Appl. No.: **795,945**

[22] Filed: **Nov. 18, 1991**

[51] **Int. Cl.**[5] **B41F 23/04**

[52] **U.S. Cl.** **101/487**; 101/349; 101/216; 165/89

[58] **Field of Search** 101/487, 424.1, 349, 101/350, 216; 165/89, 36, 30; 236/12.13; 34/13, 62

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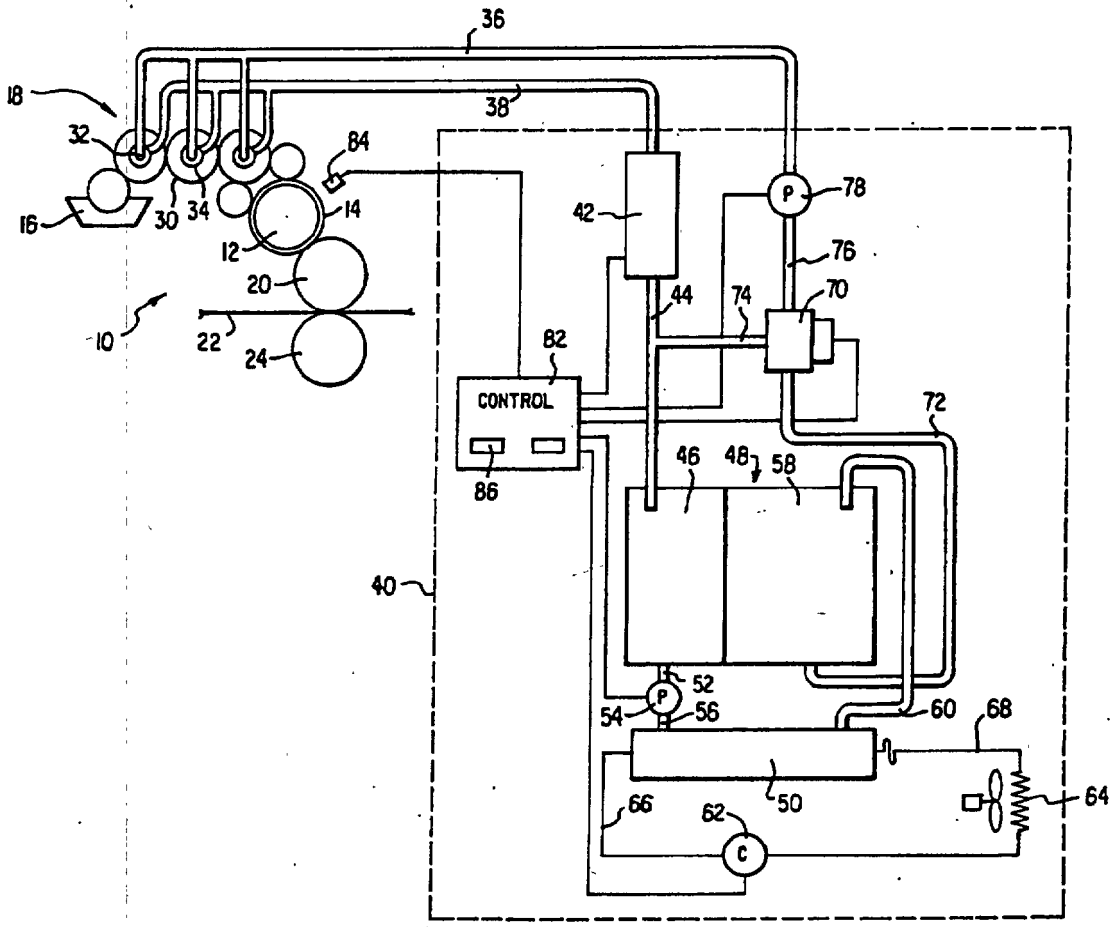
Primary Examiner—Edgar S. Burr
Assistant Examiner—Lynn D. Hendrickson
Attorney, Agent, or Firm—Mark I. Feldman

[57] **ABSTRACT**

In a rotary press, temperature of a printing plate is sensed by an infrared temperature sensor mounted in close proximity to a cylinder carrying the printing plate. Sensor output is used to control a closed loop of a water circulating system which includes one or more water-carrying rollers in an ink train. A water cooler and a water heater are provided in the closed loop and are controlled in response to the sensor output to maintain the printing plate at a temperature which allows proper inking thereof.

8 Claims, 1 Drawing Sheet



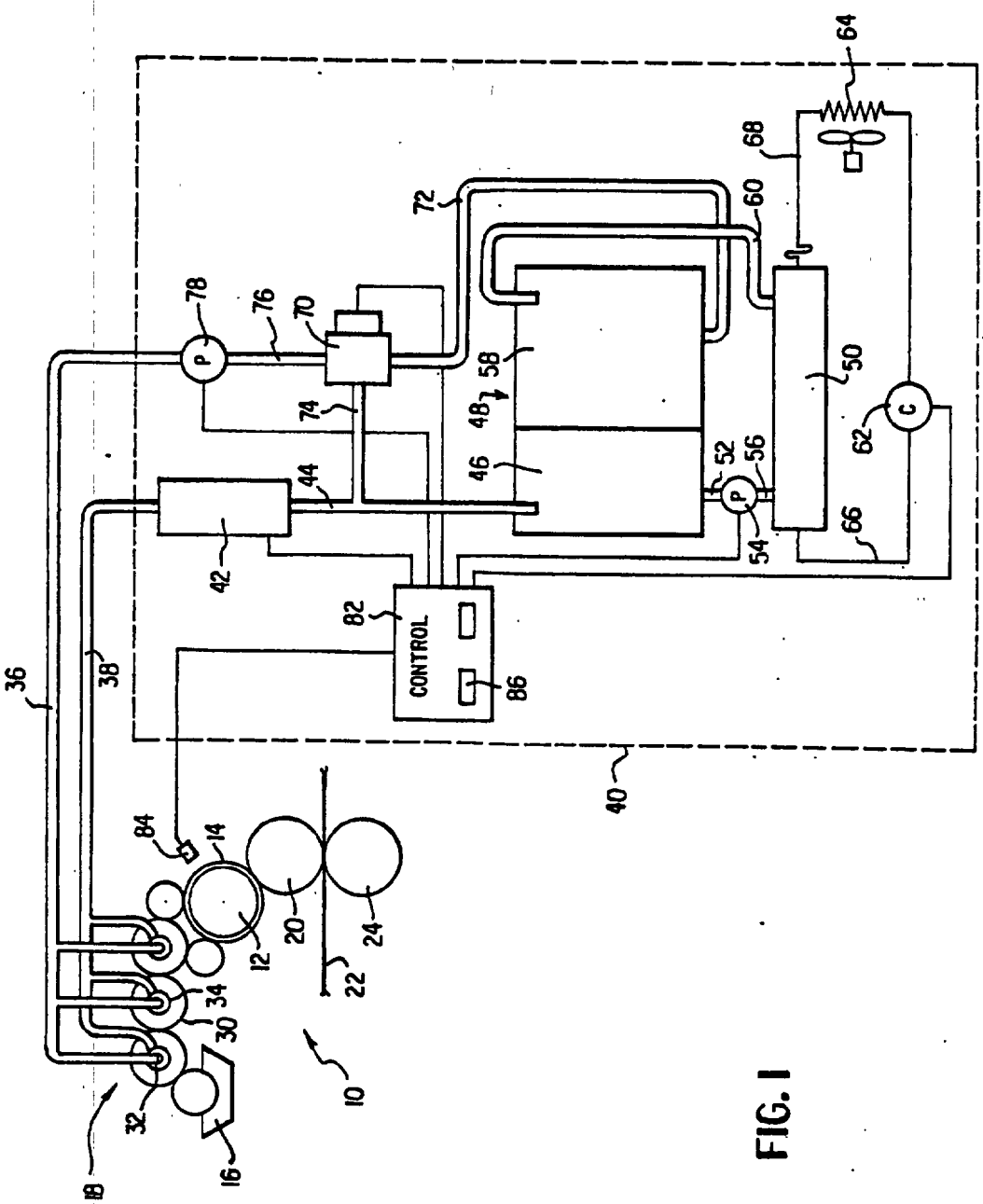

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FIG. 1

APPARATUS AND METHOD FOR CONTROLLING TEMPERATURE OF PRINTING PLATE ON CYLINDER IN ROTARY PRESS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention pertains to rotary printing presses and, more particularly, to the control of the temperature of the plate on a cylinder in such presses.

2. Description of the Related Art

The temperature of the plate on a cylinder of a rotary printing press is important in maintaining printing quality as the ability to achieve proper inking of the plate is related to temperature. If the plate temperature is too high, the ink viscosity drops. Thus, the ink breaks down and tends to adhere to the nonimage bearing areas of the plate. Improper inking may also occur when the plate temperature is too low.

U.S. Pat. No. 2,971,460 issued to Shindle in 1961 and discloses a system for controlling ink roller temperature in a printing press by means of water circulating through the hollow interior of the rollers. This system is primarily concerned with heating of the rollers with heat extracted from web cooling rollers. When cooling of the inking rollers is necessary, the system relies on the use of cold water from an external source with the subsequent discharge of the water to a drain. However, such an open circulation system is wasteful of water.

Temperature control in the Shindle system is by way of thermostatic valves which are responsive to the water temperature which is, effectively, only an indirect measurement of the inking roller temperature.

Modern rotary presses and the inks used therewith are such that cooling, rather than heating, of the inking train and printing plate has primary importance. It is, accordingly, a primary object of the present invention to provide a system for effecting such cooling in an efficient, water-conserving manner.

In the printing process, the critical temperature for proper inking is that of the printing plate itself. It is also a principal object of the present invention to provide a temperature control system which is directly responsive to the plate temperature.

A further object of the invention is the provision of such a temperature control system which is capable of either cooling or heating the printing plate.

SUMMARY OF THE INVENTION

The above and other objects of the invention will become apparent hereinafter and are achieved by the provision of a plate temperature control system for a rotary printing press. This system includes a closed loop water circulating system including one or more, preferably three, hollow, water-carrying rollers in the ink train of the press, a water heater, a water cooler, a controlled mixing valve, and a circulating pump; an electrical control system for the water heater, water cooler, mixing valve and pump; and an infrared temperature sensor being mounted in close proximity to the plate cylinder of the press to detect its temperature. The sensor also provides input to the control system.

For a more complete understanding of the invention and the objects thereof, reference should be made to the accompanying drawing and the following detailed description wherein a preferred embodiment of the invention is illustrated and described.

DESCRIPTION OF THE DRAWING

In the drawing:

FIG. 1, the sole FIGURE, is a schematic showing of a rotary printing press and the plate temperature control system of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Generally, a rotary offset printing press **10**, with the exception of the temperature control system of the present invention, has a conventional design and construction. Such a press **10** includes a plate cylinder **12** which carries, on the circumferential face thereof, a printing plate **14**. Ink is furnished to the plate **14** from a fountain **16** by way of an ink train **18** consisting of a plurality of inking rollers **30**. As is well known, the plate **14** is etched so as to be ink receptive only in those areas which are to be printed. From the plate **14**, the ink is transferred to a blanket cylinder **20** and then to a sheet or web **22** of paper or the like brought into contact therewith by an impression cylinder **24**.

As was discussed above, proper inking of the plate **14**, so as to provide quality printing, is dependent, in part, on the ink temperature as it is applied to the plate **14**. Excessive temperature causes a lowering of ink viscosity and a break down of the ink with smearing of the ink onto the nonprinting regions of the plate **14**. Improper inking of the plate **14** may also occur when the ink temperature is too low, as may be the case during start-up or after the press **10** has been shutdown for a long period of time.

In accordance with the present invention, a closed loop water circulating system responsive to the temperature of the printing plate **14** is provided to maintain the desired plate temperature and, accordingly, the temperature of the ink applied thereto. In this system, one or more, preferably three, of the rollers **30** of the ink train **18** are hollow and are provided with rotary water inlet and outlet connections **32** and **34**, respectively, whereby water is circulated within the rollers **30** in heat exchange therewith. The details of such rollers **30** and rotary connections **32** and **34** are well known and need not be further described herein.

Supply and return conduits **36** and **38**, respectively, connect the rollers **30** to a water circulating and cooling/heating unit **40**. Water entering the unit **40** from conduit **38** flows first through a water heater **42** which is, preferably, a flow-through electric heater, to a pipe **44** leading to an inlet chamber **46** of a dual chamber reservoir **48**. A water chiller **50** has its inlet connected to the inlet chamber **46** by a pipe **52**, a first circulating pump **54**, and a pipe **56**. The water chiller **50** has its outlet connected to an outlet chamber **58** of the reservoir **48** by a pipe **60**. The chiller **50** is connected to a refrigeration system including a compressor **62** and a condenser **64** via refrigerant lines **66** and **68**, respectively. A controllable mixing valve **70** has its first inlet connected by piping **72** to the outlet chamber **58** of the reservoir **48** and its second inlet connected to a pipe **74** which branches from the pipe **44**. The outlet of the valve **70** is connected by piping **76** to a second circulating pump **78** which, in turn, has its outlet connected to the supply conduit **36**.

The cooling/heating unit **40** is capable of circulating either cooled or heated water through the rollers **30** of the ink train **18** in order to maintain the ink at the desired temperature for proper inking of the plate **14**.

Operation of the unit 40 is regulated by an electrical control unit 82 in accordance with the temperature of the printing plate 14. A plate temperature sensor 84 provides an input to the control unit 82. In the preferred embodiment, this sensor 84 is an infrared sensor mounted in close proximity to the periphery of the printing plate 14 of the cylinder 12, preferably midway between the ends thereof. It will be appreciated, however, that other types of sensors for detecting the temperature of the printing plate 14 may be employed. The control unit 82 is provided with an appropriate input device 86 by which the desired plate temperature is supplied manually by an operator of the printing press 10.

The operation of the invention will now be described. When the press 10 is initially started, the cylinders 12 and the rollers 30 may be such that the plate temperature is lower than desired. Under these circumstances, the control unit 82 activates the second circulating pump 78 and the water heater 42. The unit 82 also energizes the mixing valve 70 so that water is circulated through the heater 42, the pipe 44, the branch pipe 74, and the pipe 76 to the second circulating pump 78 to supply heated water to the conduit 36 for circulation through the hollow ink rollers 30.

As the plate temperature rises due both to heat supplied by the unit 40 and also due to frictionally generated heat occurring during operation of the press 10, cooling of the printing plate 14 becomes necessary to maintain the desired inking temperature. In the cooling mode of the unit 40, the heater 42 is turned off while the chiller 50 is activated to maintain a supply of cooled water in the outlet chamber 58. The mixing valve 70, under control of the control unit 82, regulates the temperature of the water supplied to the inking rollers 30 through the conduit 36 by proportioning the amount of cooled water from the chamber 58 with the amount of warm water returning from the rollers 30 through the conduit 38 and the branch pipe 74. By way of example, if a plate temperature of 60° F. is desired, the temperature of the water supplied is about 48° F. as will be apparent to those skilled in the art, the temperatures are dependent on several factors, including the speed of the operating press 10 and the amount of ink coverage.

While, in the illustrated embodiment, the cooling/heating unit 40 is an integrated unit, it may be preferable to have the reservoir 48 and the water chiller 50 located separately from the remainder of the unit 40. The space available for installation, as well as other factors, determine the particular configuration.

As these and other changes may be made in the described embodiment of the invention without departing from the spirit thereof, reference should be had to the appended claims in determining the true scope of the invention.

What is claimed is:

1. A temperature control system for a printing plate of a rotary press of a type having a cylinder, said printing plate being carried on the cylinder, and an ink train including a plurality of ink rollers, at least one of which rollers is hollow and equipped with connections for circulating water in a heat exchange relationship therethrough, said system comprising:

a water circulating unit including a two-chambered water reservoir, two circulating pumps, a water chiller, a water heater and a controllable mixing valve, said circulating unit being connected to the hollow roller to provide a closed loop water circulating path;

temperature sensing means for detecting a temperature of the printing plate and also for generating a signal corresponding to a detected plate temperature; and

means, responsive to the signal, for controlling the circulating unit so as to regulate a temperature of the water circulating through the closed loop path in accordance with the detected plate temperature.

2. The temperature control system of claim 1 wherein said temperature sensing means comprises an infrared temperature sensor mounted in close proximity to the cylinder.

3. A temperature control system for a printing plate of a rotary press of a type having a cylinder, said printing plate being carried on the cylinder, and an ink train including a plurality of ink rollers, at least one of which rollers is hollow and equipped with connections for circulating water in a heat exchange relationship therethrough, said system comprising:

a water circulating unit including a circulating pump, a water chiller, and a controllable mixing valve, said circulating unit being connected to the hollow roller to provide a closed loop water circulating path;

temperature sensing means for detecting a temperature of the printing plate and also for generating a signal corresponding to a detected plate temperature; and

means, responsive to the signal, for controlling the circulating unit so as to regulate a temperature of the water circulating through the closed loop path in accordance with the detected plate temperature;

wherein said temperature sensing means comprises an infrared temperature sensor mounted in close proximity to the cylinder;

wherein the circulating unit further includes a water heater; and

wherein the circulating unit further includes a reservoir having a first chamber receiving water returned from the roller and also having a second chamber, said water chiller being connected between the first chamber and the second chamber, said mixing valve having a first inlet connected to the second chamber for receiving cooled water therefrom and also having a second inlet for receiving water returned from the roller, said mixing valve being operable to proportion water flow through the first inlet and the second inlet in accordance with a desired water temperature.

4. A temperature control system for a printing plate of a rotary press of a type having a cylinder, said printing plate being carried on the cylinder, and an ink train including a plurality of ink rollers, at least one of which rollers is hollow and equipped with connections for circulating water in a heat exchange relationship therethrough, said system comprising:

a water circulating unit including a circulating pump, a water chiller, and a controllable mixing valve, said circulating unit being connected to the hollow roller to provide a closed loop water circulating path;

temperature sensing means for detecting a temperature of the printing plate and also for generating a signal corresponding to a detected plate temperature; and

means, responsive to the signal, for controlling the circulating unit so as to regulate a temperature of the water circulating through the closed loop path in accordance with the detected plate temperature;

wherein the circulating unit further includes a water heater; and

wherein the circulating unit further includes a reservoir having a first chamber receiving water returned from the roller and also having a second chamber, said water chiller being connected between the first chamber and the second chamber, said mixing valve having a first inlet connected to the second chamber for receiving cooled water therefrom and also having as second inlet for receiving water returned from the roller, said mixing valve being operable to proportion water flow through the first inlet and the second inlet in accordance with a desired water temperature.

5. A temperature control system for a printing plate of a rotary press of a type having a cylinder, said printing plate being carried on the cylinder, and an ink train including a plurality of ink rollers, at least one of which rollers is hollow and equipped with connections for circulating water in a heat exchange relationship therethrough, said system comprising:

a water circulating unit including a circulating pump, a water chiller, and a controllable mixing valve, said circulating unit being connected to the hollow roller to provide a closed loop water circulating path;

temperature sensing means for detecting a temperature of the printing plate and also for generating a signal corresponding to a detected plate temperature; and

means, responsive to the signal, for controlling the circulating unit so as to regulate a temperature of the water circulating through the closed loop path in accordance with the detected plate temperature;

wherein the circulating unit further includes a reservoir having a first chamber receiving water returned from the roller and also having a second chamber, said water chiller being connected between the first chamber and the second chamber, said mixing valve having a first inlet connected to the second chamber for receiving cooled water therefrom and also having a second inlet for receiving water returned from the roller, said mixing valve being operable to proportion water flow through the first inlet and the second inlet in accordance with a desired water temperature.

6. A method of controlling a temperature of a printing plate of a rotary press of a type having a cylinder, said printing plate being carried on the cylinder, said rotary press having an ink train with a plurality of ink rollers, at least one of which is hollow and equipped with connections for circulating water in a heat exchange relationship therethrough, said method comprising the steps of:

pumping circulating water in a closed loop path from a two-chambered water reservoir to a controllable mixing valve through at least one hollow roller and back to the water reservoir;

measuring the temperature of the printing plate via a sensor;

generating from the sensor a signal corresponding to a measured plate temperature; and

controlling temperature of the circulating water via a water heater and a water chiller in response to the signal corresponding to the measured plate temperature.

7. A temperature control system for a printing plate of a rotary press of a type having a cylinder, said printing plate being carried on the cylinder, and an ink train including a plurality of ink rollers, at least one of which rollers is hollow and equipped with connections for circulating water in a heat exchange relationship therethrough, said system comprising:

a water circulating unit including a two-chambered water reservoir, two circulating pumps, a water chiller, a water heater, and a controllable mixing valve, said circulating unit being connected to the hollow roller to provide a closed loop water circulating path;

temperature sensing means for detecting a temperature at a selected point of the rotary press and also for generating a signal corresponding to a detected temperature at the selected point; and

means, responsive to the signal, for controlling the circulating unit so as to regulate a temperature of the water circulating through the closed loop path in accordance with the detected temperature at the selected point.

8. A method of controlling a temperature of a printing plate of a rotary press of a type having a cylinder, said printing plate being carried on the cylinder, said rotary press having an ink train with a plurality of ink rollers, at least one of which is hollow and equipped with connections for circulating water in a heat exchange relationship therethrough, said method comprising the steps of:

pumping circulating water in a closed loop path from a two-chambered water reservoir to a controllable mixing valve through at least one hollow roller and back to the water reservoir;

measuring the temperature at a selected point of the rotary press via a sensor;

generating from the sensor a signal corresponding to a measured temperature at the selected point; and

controlling temperature of the circulating water via a water heater and a water chiller in response to the signal corresponding to the measured temperature at the selected point.

* * * * *

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US005476041A

United States Patent [19]

Czotscher

[11] Patent Number: 5,476,041

[45] Date of Patent: Dec. 19, 1995

[54] **PRINTING PRESS HAVING A DEVICE FOR CONTROLLING THE AIR IN A SHEET FEEDER**

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[73] Assignee: **Heidelberger Druckmaschinen Aktiengesellschaft**, Heidelberg, Germany

[21] Appl. No.: **288,471**

[22] Filed: **Aug. 10, 1994**

[30] **Foreign Application Priority Data**

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[51] **Int. Cl.**[6] **B41F 13/24**

[52] **U.S. Cl.** **101/232**; 271/97; 271/98

[58] **Field of Search** 101/232, 248, 101/216; 271/227, 236, 250, 11, 96, 97, 98, 20

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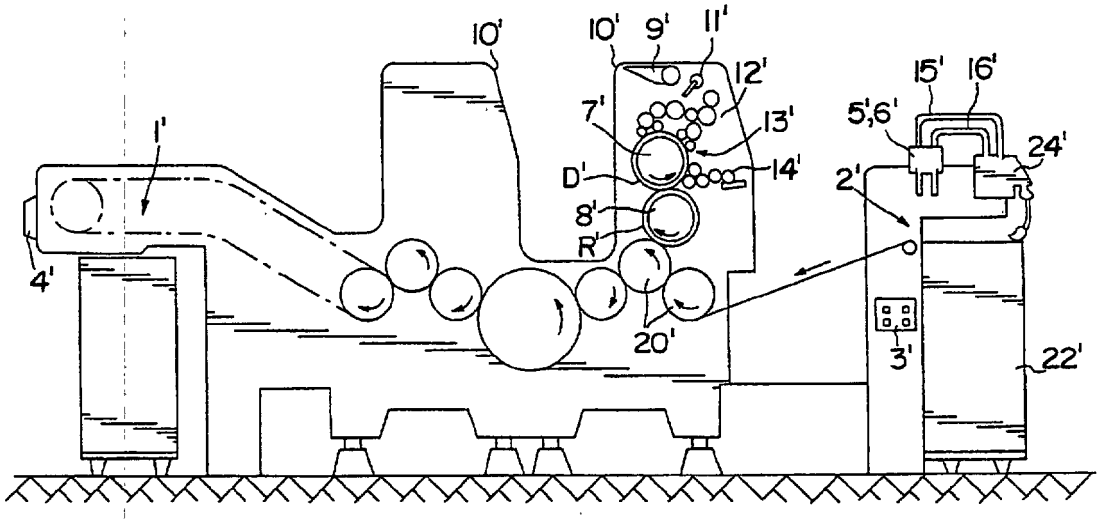
Primary Examiner—Eugene H. Eickholt

Attorney, Agent, or Firm—Nils H. Ljungman & Associates

[57] **ABSTRACT**

A printing press for printing an image on sheets of printing stock can generally have a sheet feeder for separating and at least initiating start of transport of the separated sheet into the printing press. Such a sheet feeder can have a device for controlling feeder blowing air and feeder suction air, wherein the control device can have respective valves for accurately controlling the amount of blowing air and suction air. In addition, the amount of blowing air can be essentially exactly adjustable via the control console of the machine.

20 Claims, 4 Drawing Sheets



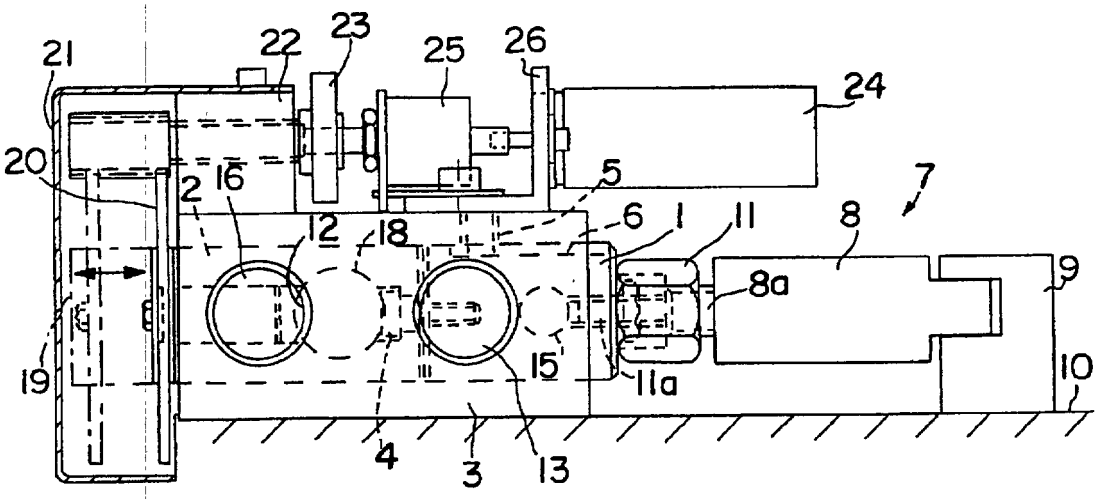

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FIG.1

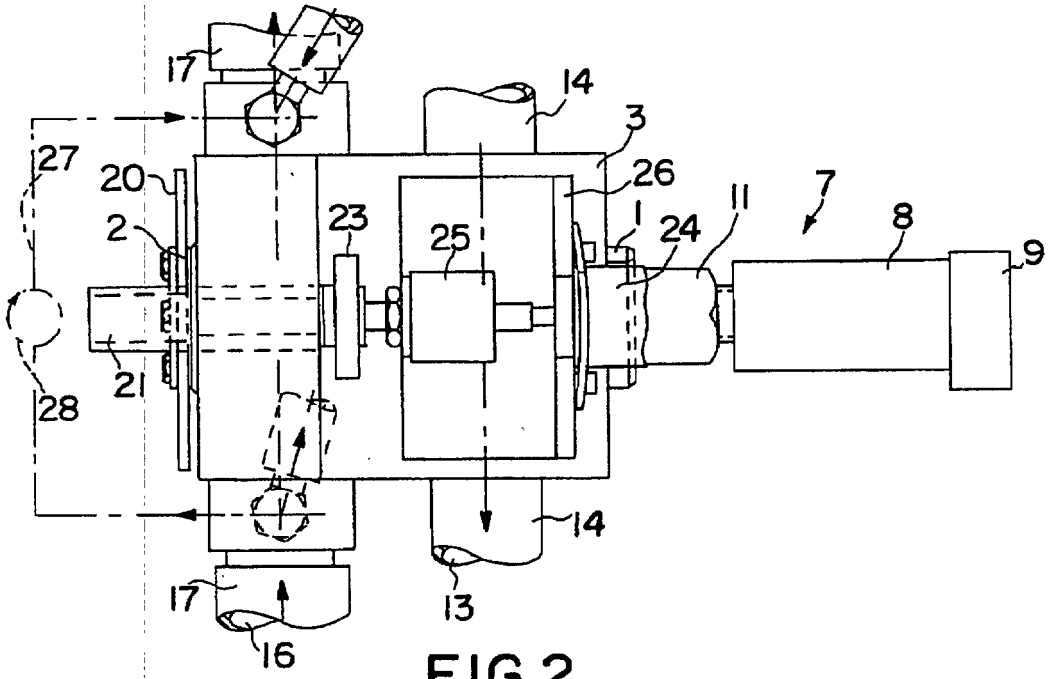
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FIG.2

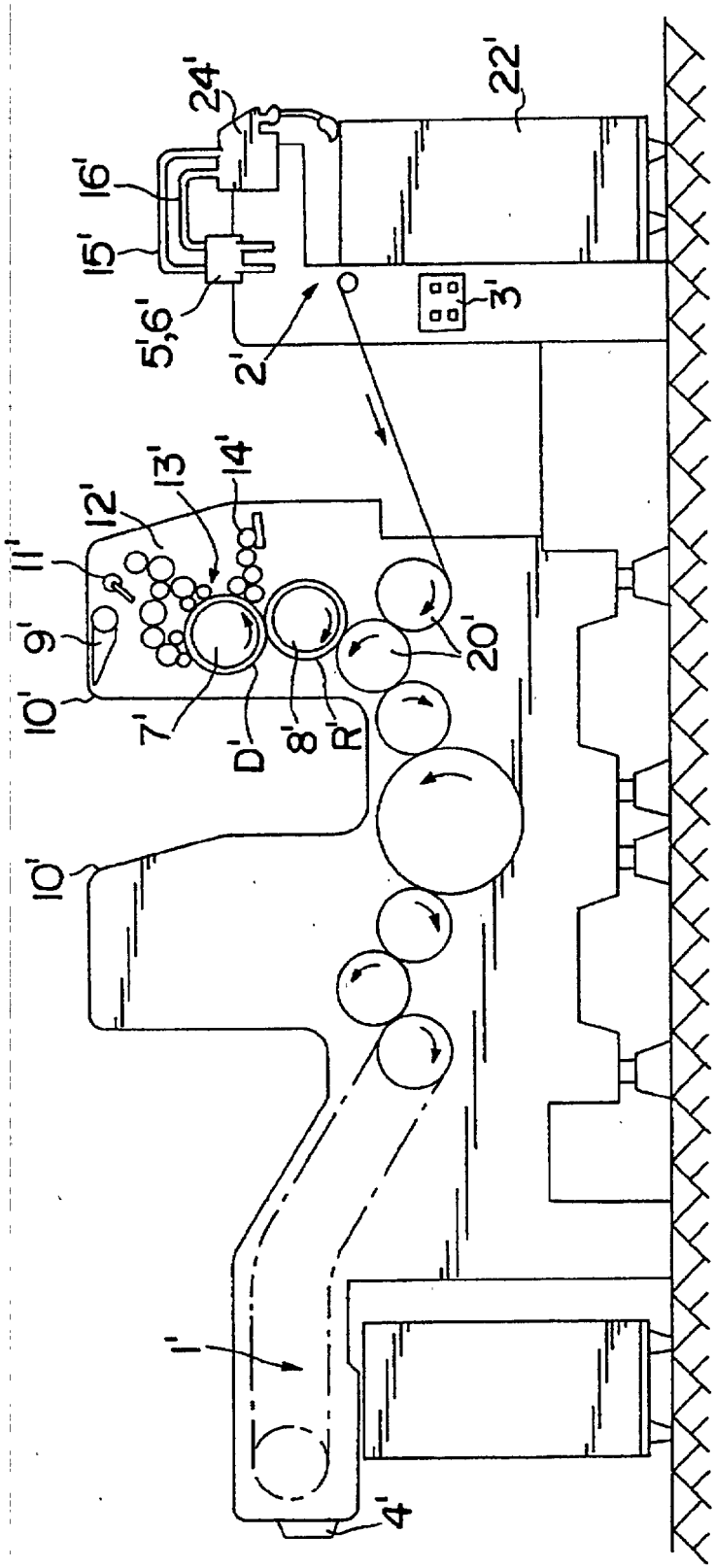

FIG. 1a

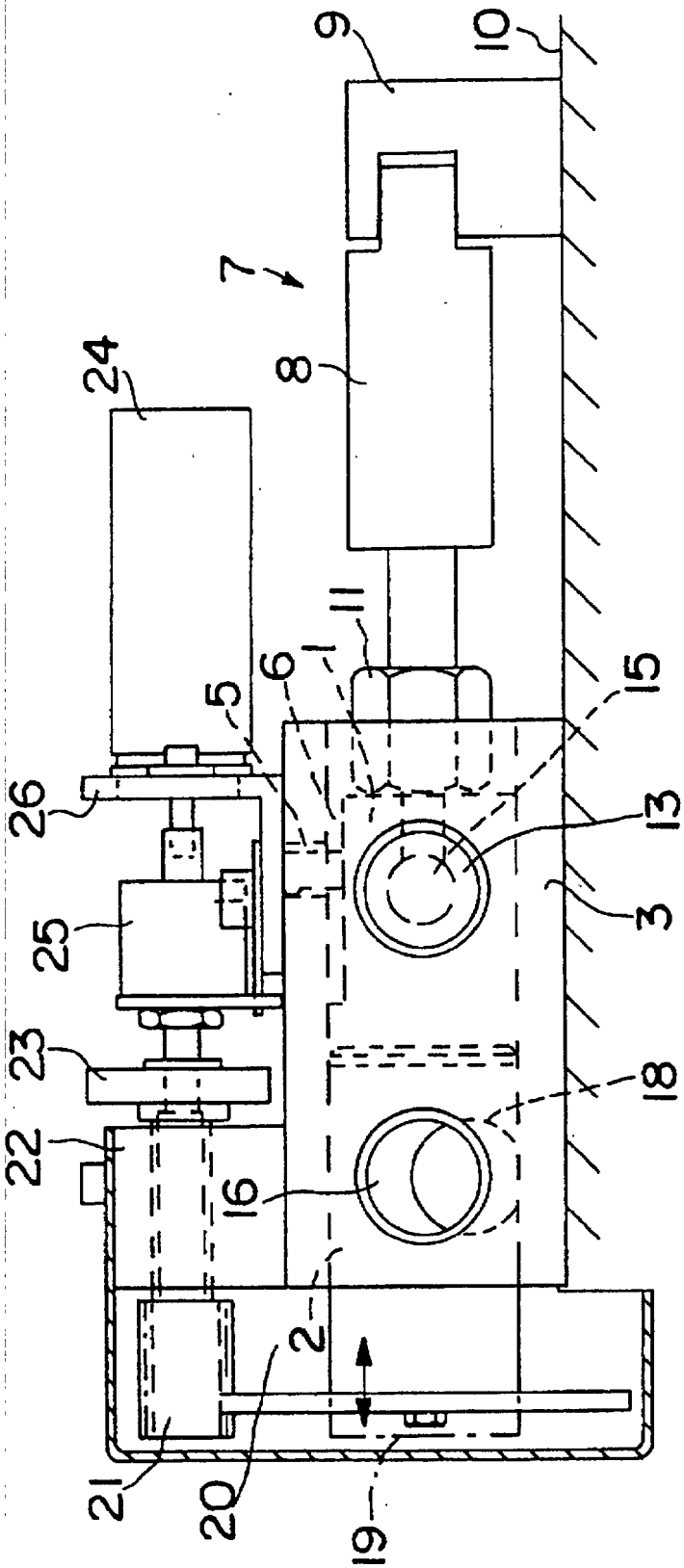

FIG.3

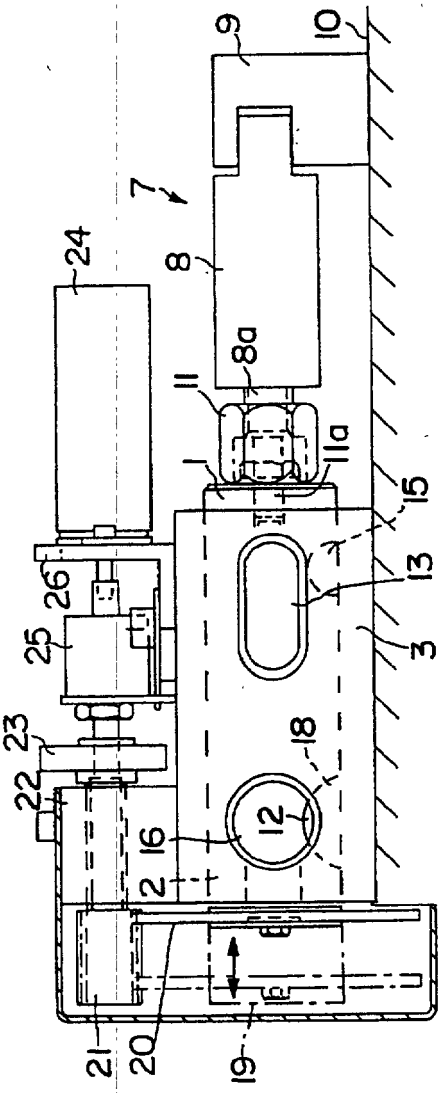
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FIG.4

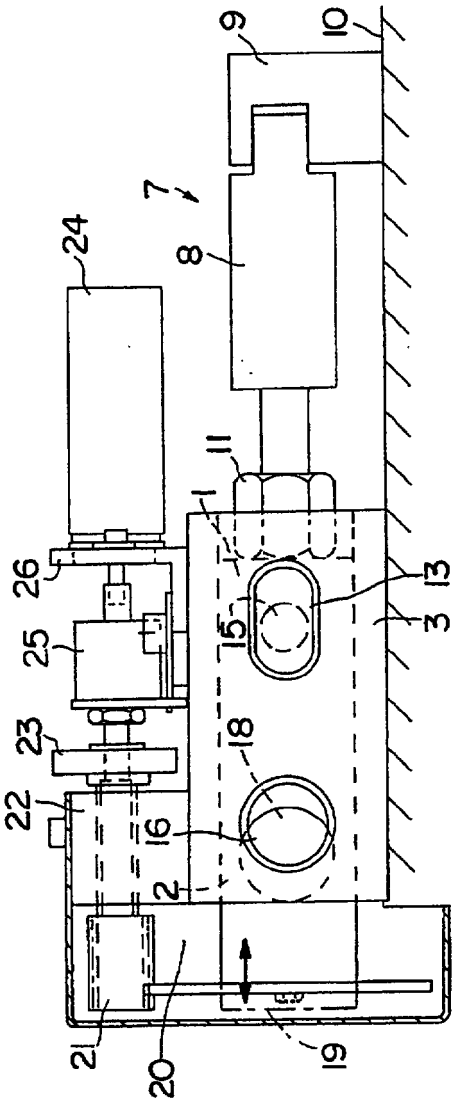
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FIG.5

PRINTING PRESS HAVING A DEVICE FOR CONTROLLING THE AIR IN A SHEET FEEDER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention generally relates to a printing machine, or press having a sheet feeder, and more specifically, to a device for controlling feeder blowing air and feeder suction air in a sheet feeder of a printing machine, or press. In general, printing presses are configured to handle large quantities of sheets of printing stock supplied in the form of a stack. For this purpose, sheet feeders which utilize air currents have been developed for repeatedly separating single sheets from a stack of sheets and initiating transport of the separated single sheets into the printing press. Such sheet feeders can utilize a blowing jet of air to fan the uppermost sheets of the stack, while a suction device can be provided to then suck the uppermost sheet thereto, and also to initiate movement of the sheet attached thereto into the printing press. The air suction and supply are generally controlled by a control device, which control device generally comprises respective valves for each of the feeder and blower air.

2. Background Information

A known embodiment of such a device is disclosed by German Laid Open Patent Application No. 39 31 995 A1, which corresponds to U.S. Pat. No. 5,068,876. This known embodiment provides two separate rotary valves for controlling the air, and each valve is individually controlled via an electromagnet. With this embodiment the rotary travel of an individual valve body may be manually adjusted via a rotary-travel limiter. Furthermore, fanning air supplied to the sheet feeder can also be manually adjusted via an adjusting screw so that the pressman does not have any exact adjusting values at hand, or in other words, so that the pressman does not have to remember the adjustment values that are input through the control.

OBJECT OF THE INVENTION

Proceeding from this known device, it is the object of the present invention to provide an air-controlling device for a sheet feeder of a printing press, which air-controlling device can preferably accurately control both blowing air and suction air, and by means of which air-controlling device, the blowing-air amount may be adjusted via the control console of the printing press.

SUMMARY OF THE INVENTION

According to the present invention this object can essentially be achieved by preferably providing both a first valve body for controlling the suction air and a second valve body for controlling the blowing air in a housing so as to be axially aligned. The two valve bodies are also preferably connected to each other in a manner so as to be axially firm, or moveable essentially simultaneously in an axial direction, while still being mutually turnable with respect to one another. One manner in which such a connection can be provided can preferably be by means of a fitting bolt. Further, an adjusting means can preferably be provided for axially adjusting both valve bodies to switch the suction air and the blowing air on and off. This adjusting means can preferably act on one of the two valve bodies, and there can preferably be provided a further drive device, which, via a pair of gears, can turn a valve body in order to control the blowing-air amount.

Such a solution essentially permits very short control periods, while enabling one adjusting means to control the suction air and the blowing air, respectively. Moreover, via the control console, the pressman may then also be able to accurately adjust the blowing-air amount for the respective sheet material which is being processed, while the blowing-air adjustment that is selected can also preferably be maintained when switching off end on the blowing air.

In an advantageous embodiment of the present invention, the valve bodies can also preferably be axially adjustable, with respect to the axial adjusting device, via an adjusting nut, to thereby allow for variations in-the size of a small opening through which the fanning air may escape when the valves are closed. Further, so that both valve bodies do not rotate when the blowing air is being adjusted, the valve body controlling the suction air can preferably be fixed against rotation by means of a pin.

A constructional modification of the above device can be provided by a device wherein the two valve bodies are firmly connected to each other, both axially and rotationally, while providing an adjusting means via which the two valve bodies can he turned in order to switch the suction air and the blowing air on and off, respectively. For this embodiment, there can preferably be provided a drive, via which the blowing-air amount can be controlled by axially displacing the valve bodies. According to this solution, given a similar setup of the valve bodies, essentially only the adjusting means is used to turn the valve bodies, and the drive serves to axially displace the valve bodies, and thus control the blowing-air amount. This exchange of adjusting means and drive means, in comparison with the first embodiment, also permits short control periods and an essentially exact adjustment of the amount off air required.

An advantageous embodiment of the two modifications described above, provides that as the adjusting means, there can preferably be provided a pneumatic cylinder for acting on the two valve bodies for controlling the suction air and the blowing air, respectively. In addition, the drive controlling the amount of blowing air can preferably be designed as a geared motor which, via a potentiometer, adjusts the second valve body. The use of a pneumatic cylinder permits very short control periods, and the use of a geared motor, in combination with a potentiometer for monitoring operation of the motor, ensures a very exact adjustment and allows for a display of the adjusted value at the control desk.

In summary, one aspect of the invention resides broadly in a printing press comprising: a frame; a plate cylinder rotatably mounted on the frame, the plate cylinder for positioning a printing plate thereon; dampening apparatus for applying dampening medium to the printing plate; an ink reservoir for holding a supply of ink; an inking mechanism for transferring the ink between the ink reservoir and the plate cylinder at least during operation of the printing press; the inking mechanism comprising a plurality of inking rollers, at least one ink fountain roller, and at least one ink transfer roller for transferring ink between the ink fountain roller and at least one of the plurality of inking rollers; sheet feeding apparatus for feeding sheets of printing stock into the printing press from a stack of printing stock, the stack having a top for supplying sheets therefrom; a rubber blanket cylinder having a rubber blanket disposed thereabout for receiving an ink impression from the plate cylinder; a sheet drum for receiving sheets being fed for printing the ink impression of the rubber blanket onto the sheets;

sheet delivery apparatus for receiving printed sheets and stacking the printed sheets; the sheet feeding apparatus comprising: apparatus for providing input air to an area adjacent the stack of printing stock; apparatus for removal of exhaust air from an area adjacent the stack of printing stock; apparatus for controlling air flow through the apparatus for providing input air and the apparatus for removal of exhaust air; the apparatus for controlling comprising valve apparatus; the valve apparatus comprising: a first valve portion for controlling flow of air through the apparatus for providing input air, the first valve portion having at least an open configuration for passage of air therethrough and a closed configuration for blocking passage of air therethrough; a second valve portion for controlling flow of air through the apparatus for removal of exhaust air, the second valve portion having at least an open configuration for passage of air therethrough and a closed configuration for blocking passage of air therethrough; at least one solid element connecting at least a portion of i the first valve portion to at least a portion of the second valve portion for substantially simultaneously moving both of the at least a portion of the first valve portion and the at least a portion of the second valve portion between at least the open configuration and the closed configuration; and single operating apparatus for operating all of the at least a portion of the first valve portion, the at least a portion of the second valve portion and the at least one solid element substantially simultaneously.

Another aspect of the invention resides broadly in a device for controlling air flow in a sheet feeder in a printing press, the sheet feeder having apparatus for providing input air thereinto and apparatus for removal of exhaust air therefrom, the device for controlling comprising: valve apparatus for controlling air flow through the apparatus for providing input air and the apparatus for removal of exhaust air; the valve apparatus comprising: a first valve portion for controlling flow of air through the apparatus for providing input air, the first valve portion having at least an open configuration for passage of air therethrough and a closed configuration for blocking passage of air therethrough; a second valve portion for controlling flow of air through the apparatus for removal of exhaust air, the second valve portion having at least an open configuration for passage of air therethrough and a closed configuration for blocking passage of air therethrough; at least one solid element connecting at least a portion of the first valve portion to at least a portion of the second valve portion for substantially simultaneously moving both of the at least a portion of the first valve portion and the at least a portion of the second valve portion between at least the open configuration and the closed configuration; and single operating apparatus for operating all of the at least a portion of the first valve portion, the at least a portion of the second valve portion and the at least one solid element Substantially simultaneously.

BRIEF DESCRIPTION OF THE DRAWINGS

Specimen embodiments of a control device in accordance with the present invention are schematically illustrated in the accompanying drawings, in which:

FIG. 1*a* shows a side view of a printing press incorporating a device for controlling feeder blowing and suction air in accordance with the present invention;

FIG. 1 shows a side elevational view of a first embodiment of an air-controlling device in an off position;

FIG. 2 shows a plan view of the device shown in FIG. 1;

FIG. 3 shows a side elevational view of the valve of FIG. 1, but in en on position;

FIG. 4 shows a side elevational view of a second embodiment of an air-controlling device in an off position; and

FIG. 5 shows a side elevational view of the valve of FIG. 4, but in an on position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1*a* depicts a printing machine, or printing press, having a number of rotary printing stands **10'**, with a sheet delivery **1'** and a sheet feeder **2'**, which sheet feeder **2'** can employ an air control device **5'**, **6'** in accordance with the present invention, and described in further detail herebelow. In addition, a rotary print stand **10'** can also generally include: an ink supply source **9'** for containing a supply of ink, a plate cylinder **7'** for having mounted thereon a printing plate D'; an inking unit **12'** which includes ink applicator rollers **13'** for applying ink to the printing press; a vibrator roller **11'** for receiving ink from the ink supply **9'** and transferring the ink to the inking unit **12'**, a damping, or wetting unit **14'** for transferring a damping agent to the printing plate D'; a blanket cylinder **8'** carrying a rubber blanket R' for receiving an ink impression from the plate cylinder **7'**, and sheet drums **20'** for carrying a sheet of printing stock to the rubber blanket cylinder **8'** for transfer of the ink from the rubber blanket cylinder **8'** to the sheet of printing stock. Such a printing press can also have other accessory units, such as washing units, drive units, etc. which are well known and are not shown in the drawings.

The sheet feeder **2'** can preferably have a stack of sheets of printing stock **22'** and an air blower and suction device **5'**, **6'** **15'**, **16'** and **24'**, for lifting and transferring single sheets into the printing press. Such an air device can generally have two valve units **5'**, **6'** with one Valve unit corresponding to each of a suction air passage **15'** and a blower passage **16'**. The valves **5'** and **6'** can preferably be controlled from an operator control panel **3'**. Besides being operable via the operator controls **3'** at the sheet feeder **2'**, the sheet feeder **2'** may also be operated from a control console **4'** located at the delivery pile **1'**.

It should be understood that the components as discussed above with relation to FIG. **1***a*, may, if appropriate, essentially be considered to be interchangeable with similar components discussed herebelow with relation to FIGS. **1–5**.

As depicted in FIGS. **1–3**, a first valve body **1**, of a valve unit such as unit **5'**, **6'** as discussed previously in FIG. **1***a*, can preferably be provided in a housing **3** for controlling the suction air to a sheet feeder, and a second valve body **2** can preferably be provided for controlling the blowing air. In the depicted embodiment of FIG. **1**, the valve bodies **1** and **2** are shown in an off position, and are arranged so as to be displaceable to the left to move the valve bodies **1** and **2** into a corresponding open position for flow of air therethrough. FIG. **3** depicts one possible configuration of the valve bodies **1** and **2** in a corresponding on position.

Both valve bodies **1**, **2** are preferably connected to each other in an axially firm and mutually turnable manner. One type of connection devise which could be used is a fitting bolt **4**, which enables the valve body **2**, controlling the blowing air, to be turned with respect to the valve body **1**, while also enabling both valve bodies to be displaced axially substantially simultaneously. In this embodiment, the valve body **1** can preferably be fixed against rotation in the housing **3** by means of a pin **5** engaging in a longitudinal groove **6** formed in the valve body **1**. Alternatively, a pin could extend from valve body **1** to engage a slot within the

housing 3. Further, other means of holding the valve body i stationary could also conceivably be used, such as a rigid connection, to an adjusting device 7.

In the specimen embodiment shown in FIG. 1 an adjusting device 7 acts on the first valve body 1, and therefore, in essence, acts on both bodies 1 and 2 because of the axial connection 4 therebetween. The adjusting device 7 can preferably be designed as a pneumatic cylinder 8 which, via a supporting bearing 9, can be attached to a wall 10 or any surface adjacent the valve device. Again, FIG. 1 shows the cylinder 8 retracted so that the valve bodies 1 and 2 are in an off, or substantially closed position. In this closed position, by means of an adjusting nut 11, the two valve bodies 1, 2 can be axially adjusted, if necessary, so that a small opening 12 can exist for the escape of fanning air. By means of such an adjustment, the size of the opening 12 can also preferably be adjusted very accurately for different paper thicknesses, etc. to allow more or less fanning air to escape therethrough. In at least one embodiment of the present invention, this adjusting nut 11 can preferably be axially fixed to a piston rod 8*a*, such that rotation thereof will draw a threaded rod 11*a* thereinto or push the threaded rod 11*a* away therefrom upon rotation of the nut 11, thereby axially displacing the valve bodies 1 and 2.

FIG. 1 shows the position in which the valve bodies 1, 2 are switched off so that the piston rod 8*a* of the pneumatic cylinder 8 is moved to the right into its end position. In so doing, an opening 13 of a suction-air line 14, can generally be closed as the suction-air opening 15, formed in the valve body 1, is displaced to the right and thus covered by the housing 3. The opening 16 of the blowing-air line 17 can preferably be offset with respect to the blowing-air opening 18 formed in the valve body 2 such that there remains a small opening 12 through which the fanning air may escape. The position in which the valves are open is the position in which both valve bodies 1, 2 are displaced to the left according to FIG. 1, as indicated by a dash-dotted line 19 in FIG. 1, and as is also depicted by FIG. 3.

In a sheet feeder device, it is generally desirable that the blowing and suction be provided by a single blower or fan unit, such as might be indicated as 24' in FIG. 1*a*. In other words, the air sucked out of the feeder is also the air blown back into the feeder. By providing such a valve unit wherein the blowing and suction air lines can be turned on and off substantially simultaneously using a single operational component, in accordance with the present invention, there would essentially be minimal concern about jamming of single independently operating valves for each of the blowing and suction lines, as have been used in known valve devices. Thus, both lines will either be open, or else both will be closed. On the other hand, in known devices using two separately operating valves, one valve may open when the other remains stuck shut, and there could then possibly be no suction air available while the blowing line is operating, or, alternatively, the air which is auctioned out may not be able to pass through a blocked blowing line.

In addition to the axial displacement provided by the adjusting device 7, as discussed above, an additional operating device can preferably be provided for rotating the valve body 2 with respect to the valve body 1. For this purpose, a spur gear 20 can preferably be provided for engaging in a broader spur gear 21, fastened to the front end of the valve body 2 for controlling the blowing air. The width of the spur gear 21 can preferably be designed such that the meshing of the gears is not interrupted over the axial displacement distance of the valve bodies 1, 2. The spur gear 21 can preferably be turnably mounted in a bearing body 22 and can be manually turned via a handwheel 23. Furthermore, there can also preferably be a geared motor 24 which controls the blowing-air amount and which, vie a potentiometer 25, can drive the spur gear 21. The geared motor 24 and the potentiometer 25 can preferably be fastened to the housing 3 via an angular-shaped body 26. By turning the valve body 2 via the geared motor 24 the alignment and covering of the blowing-air opening 18, and the opening 16 of the blowing-air line 17 may be varied such that a varying amount of blowing air may escape through the valve. This makes it possible to control the blowing air as a function of speed, for example, or to vary the blowing air according to the paper weight. FIG. 3 also essentially depicts an offset between the blowing air opening 18 and the opening 16, which was provided by relatively rotating the valve body 2 with respect to the valve body 1.

It should generally be understood that other types of drive systems could also possibly be used for relatively rotating the valve bodies. Such systems might include a transmission unit, such as a chain drive, or belt drive, and could even include a motor directly mounted to the end of the valve body 2, which motor could also be mounted to a holding device to be non-rotational with respect to the valve body 2. Substitution of any of the drive devices, and adjustment devices as discussed above would typically be well within the skill of the artisan, as a wide variety of drive devices are generally well known.

An alternative variant on the above embodiment of the present invention could preferably utilize, as an adjusting device 7, an electromagnet instead of a pneumatic cylinder 8. Such an electromagnet can preferably be configured to axially displace the valve bodies 1, 2, and the configuration and operation of such an electromagnet are generally well known and therefore not discussed in any:further detail herein.

The set task may also be accomplished through another inventive construction of the valve, such as could be represented by the embodiment shown in FIGS. 4 and 5. With this specimen embodiment, the blowing air can preferably be switched on and off by turning the valve bodies 1 and 2 instead of axially displacing the valve bodies 1 and 2 as was discussed hereabove. In addition, the blowing air can then preferably be regulated by axially displacing the valve bodies 1 and 2 via an axial displacement device 7, such as, a motor-driven threaded spindle, or possibly even the pneumatic cylinder as discussed above. In this manner, an adjustable opening between blowing air opening 18 and opening 16 could still be achieved.

According to this alternative embodiment, the axial position of the valve bodies 1 and 2 can preferably remain unchanged when switching on and off the blowing air. This can essentially be accomplished by simply radially turning the valve bodies 1 and 2 so that the corresponding openings are no longer essentially aligned. In the position in which the blowing air is switched off, a small opening 12, for providing fanning air for fanning the sheets, can still be achieved in that the radial adjustment can provide such an opening. With this design the blowing-air valve may be actuated together with the suction-air valve, provided the valve bodies 1, 2 are firmly connected to each other. Alternatively, as shown in FIGS. 4 and 5, the valve bodies 1 and 2 could preferably be formed of a single body piece having two openings, or passages disposed substantially diametrically therethrough.

However, the ability for the suction opening 15 to remain unchanged when regulating the blowing air, that is, after

radially adjusting the suction opening to the on position, still has to essentially be guaranteed when an axial adjustment of the blowing air is performed. For this purpose the suction-air opening **13**, formed in the housing **3**, can preferably be designed as an oblong hole, or slot, in the axial direction of the housing **3**, so that, in the switched-on position, the bore **15** provided in the valve body **1** is still aligned with the opening **13**. This oblong opening **13** should therefore preferably be of such a length that the suction-air opening remains open in view of any axial blowing-air adjustment.

As an alternative to providing a small opening **12**, as shown in FIGS. **1** and **4**, in an alternative embodiment of the present invention, it is also conceivable to supply the fanning blowing air through a bypass **27** (indicated by a broken line in FIG. 2), whereby the bypass may comprise a valve **28** for adjusting the amount of air which is able to pass therethrough.

One feature of the invention resides broadly in a device for controlling feeder air and feeder suction air in a sheet feeder of a printing machine comprising respective valves, characterized in that a first valve body **1** for controlling suction air and a second valve body **2** for controlling blowing air are disposed in a housing so as to be axially aligned, that the two valve bodies **1, 2** are connected to each other by a fitting bolt **4** in an axially firm and mutually turnable manner, that an adjusting means **7**, via which the two valve bodies are axially adjustable for switching on/off the suction air and blowing air, respectively, acts on a valve body **1**, and that there is provided a drive **24** which, via a pair of gearwheels **20, 21**, turns the valve body **2** for controlling the amount of blowing air.

Another feature of the invention resides broadly in the device characterized in that, via an adjusting nut **11**, the valve bodies **1, 2** are axially adjustable in order to vary the small opening **12** for the fanning blowing air, and that the valve body **1** controlling the suction air is fixed against rotation by means of a pin **5**.

Yet another feature of the invention resides broadly in the device characterized in that the two valve bodies **1, 2** are firmly connected to each other, that there is provided an adjusting means **7** via which the two valve bodies **1, 2** are turnable in order to switch on/off the suction air and the blowing air, respectively, and that there is provided a drive **24** controlling the amount of blowing air by axially displacing the valve bodies **1, 2**.

Still another feature of the invention resides broadly in the device characterized in that as an adjusting means **7** there is provided a pneumatic cylinder **8** acting on the two valve bodies **1, 2** for controlling the blowing air and the suction air, respectively, and that the drive controlling the amount of blowing air is designed as a geared motor **24** which, via a potentiometer **25**, adjusts the second valve body **2**.

Some examples of drive devices and potentiometers which could be used in conjunction with the present invention are disclosed by the following U.S. Pat. No. 5,215,014 to Burger and Mamberer, entitled "Positioning System for Rotary Folding Jaw Cylinder Adjustment Elements in a Rotary Printing Machine"; U.S. Pat. No. 5,034,004 to Crankshaw, entitled "Infusion Pump and Drive Systems Therefor"; U.S. Pat. No. 4,932,831 to White et al., entitled "All Terain Mobile Robot"; U.S. Pat. No. 4,931,041 to Feeset, entitled "Infusion Syringe Pump"; and U.S. Pat. No. 4,931,710 to DeVara and Kenny, entitled "Servoactuator with Feedback and Method of Calibrating".

Some example of pneumatic cylinders which could be used in conjunction with the present invention are disclosed by the following U.S. Pat. No. 4,573,369 to Horn, entitled "Linear Drive"; and U.S. Pat. No. 4,414,882 to Frei, entitled "Pneumatic Drive for Switching Elements and Control Elements".

Some examples of printing presses with sheet feeders that operate with blowing and suction air, in which the present invention could be used, and/or which provide additional components and features of printing presses and sheet feeders which could be used in conjunction with the present invention, are provided by the following U.S. Pat. No. 5,290,023 to Seaski and Honkawe, entitled "Sheet Feeder for Sheet-Fed Press"; U.S. Pat. No. 5,184,813 to Schwitmky and Stiel, entitled "Separating Jet Blast Air Control Assembly"; U.S. Pat. No. 5,076,564 to Marass, entitled "Sheet Feeder"; U.S. Pat. No. 5,110,110 to Wirz and Bergmeier, entitled "Loosening Blowers for Sheet Feeders of Sheet-Fed Rotary Printing Presses"; U.S. Pat. No. 5,092,578 to Bergmeier and Zeltner, entitled "Sheet Feeder in a Sheet-Processing Machine"; and U.S. Pat. No. 4,702,469 to Jeschke and Pollich, entitled "Apparatus and Method for Aligning Sheets".

The appended drawings in their entirety, including all dimensions, proportions and/or shapes in at least one embodiment of the invention, are accurate and to scale and are hereby included by reference into this specification.

All, or substantially all, of the components and methods of the various embodiments may be used with at least one embodiment or all of the embodiments, if more than one embodiment is described herein.

All of the patents, patent applications and publications recited herein, and in the Declaration attached hereto, are hereby incorporated by reference as if set forth in their entirety herein.

The corresponding foreign patent publication applications, namely, Federal Republic of Germany Patent Application No. P 43 26 927.3, filed on Aug. 11, 1993, having inventor Ernst Czotscher, and DE-OS P 43 26 927.3 and DE-PS P 43 26 927.3, as well as their published equivalents, and other equivalents or corresponding applications, if any, in corresponding cases in the Federal Republic of Germany and elsewhere, and the references cited in any of the documents cited herein, are hereby incorporated by reference as if set forth in their entirety herein.

The details in the patents, patent applications and publications may be considered to be incorporable, at applicant's option, into the claims during prosecution as further limitations in the claims to patentably distinguish any amended claims from any applied prior art.

The invention as described hereinabove in the context of the preferred embodiments is not to be taken as limited to all of the provided details thereof, since modifications and variations thereof may be made without departing from the spirit and scope of the invention.

What is claimed is:

1. A printing press comprising:

a frame;

a plate cylinder rotatably mounted on said frame, said plate cylinder for positioning a printing plate thereon;

dampening means for applying dampening medium to said printing plate;

an ink reservoir for holding a supply of ink;

an inking mechanism for transferring the ink between said ink reservoir and said plate cylinder at least during operation of said printing press;

said inking mechanism comprising a plurality of inking

rollers, at least one ink fountain roller, and at least one ink transfer roller for transferring ink between said ink fountain roller and at least one of said plurality of inking rollers;

sheet feeding means for feeding sheets of printing stock into the printing press from a stack of printing stock, the stack having a top for supplying sheets therefrom;

a rubber blanket cylinder i having a rubber blanket disposed thereabout for receiving an ink impression from the plate cylinder;

a sheet drum for receiving sheets being fed for printing the ink impression of the rubber blanket onto the sheets;

sheet delivery apparatus for receiving printed sheets and stacking the printed sheets;

said sheet feeding means comprising:

means for providing input air to an area adjacent the stack of printing stock, said means for providing input air comprising a first air passage for conducting input air to the area adjacent the stack of printing stock;

means for removal of exhaust air from an area adjacent the stack of printing stock, said means for removal of exhaust air comprising a second air passage for conducting exhaust air away from the area adjacent the stack of printing stock;

said first air passage being separate from and isolated from said second air passage;

means for controlling air flow through said means for providing input air and said means for removal of exhaust air;

said means for controlling comprising valve means;

said valve means comprising:

a first valve portion for controlling flow of air through said first air passage, said first valve portion having at least an open configuration for passage of air therethrough and a closed configuration for blocking passage of air therethrough;

a second valve portion for controlling flow of air through said second air passage, said second valve portion having at least an open configuration for passage of air therethrough and a closed configuration for blocking passage of air therethrough;

at least one solid element connecting at least a portion of said first valve portion to at least a portion of said second valve portion, said at least a portion of said first valve portion and said at least a portion of said second valve portion being connected by said at least one solid element for substantially simultaneous movement of both of said at least a portion of said first valve portion and said at least a portion of said second valve portion from at least the closed configuration to the open configuration for substantially simultaneous providing of air to the area adjacent the stack and removing of air from the area adjacent the stack, and for substantially simultaneously moving both of said at least a portion of said first valve portion and said at least a portion of said second valve portion from at least the open configuration to the closed configuration to substantially simultaneously stop providing of air to the area adjacent the stack and removing of air from the area adjacent the stack; and

single operating means for operating all of: said at least a portion of said first valve portion, said at least a portion of said second valve portion, and said at least one solid element, substantially simultaneously.

2. The printing press according to claim 1, wherein said valve means comprises:

a valve housing, said valve housing having first and second openings for defining at least a portion of the first air passage of said means for providing input air, and third and fourth openings for defining a second air passage of said means for removal of exhaust air;

a valve body for being disposed in said valve housing, said valve body comprising a first connecting passage for connecting said first and second openings, and a second connecting passage for connecting said third and fourth openings;

said first valve portion comprises said first and second openings and said first connecting passage;

said second valve portion comprises said third and fourth openings and said second connecting passage;

said single operating means being for moving said valve body within said valve housing to:

move said first connecting passage into at least partial alignment with said first and second openings to at least partially open said first air passage, and to substantially simultaneously move said second connecting passage into at least partial alignment with said third and fourth openings to at least partially open said second air passage; and

move said first connecting passage substantially out of alignment with said first and second openings to at least substantially close said first air passage, and to substantially simultaneously move said second connecting passage substantially out of alignment with said third and fourth openings to at least substantially close said second air passage.

3. The printing press according to claim 2, wherein:

said valve housing has an;exterior and defines a longitudinal axis;

said valve housing comprises a bore along said longitudinal axis;

said first, second, third and fourth openings being disposed through said housing from said exterior to said bore;

said valve body comprises a cylindrical body for being movably disposed within said bore;

said first and second connecting passages respectively comprise first and second bores within said cylindrical body; and

said means for operating comprises means for moving said cylindrical body within said bore to at least partially open and at least substantially close said first and second air passages.

4. The printing press according to claim 3, wherein:

said means for operating comprises first means for operating, and said first means for operating comprises one of:

means for rotating said cylindrical body within said bore; and

means for axially displacing said cylindrical body along the longitudinal axis of said bore; and

said valve means additionally comprises means for varying an amount of air flowing through said first air passage substantially independently of the amount of air flowing through said second air passage.

5. The printing press according to claim 4, wherein:

said cylindrical body defines a longitudinal axis, and said cylindrical body comprises:

a first body portion comprising said first connecting passage;

a second body portion comprising said second connecting passage, said first body portion being axially disposed with respect to said second body portion along said longitudinal axis of said cylindrical body;

said at least one solid element comprises means for rotatably connecting said first body portion to said second body portion for relative rotational movement between said first body portion and said second body portion;

said first means for operating comprises means for axially displacing said cylindrical body within said bore;

said valve means further comprises means for inhibiting rotation of said second body portion; and

said means for varying an amount of air flowing through said first air passage substantially independently of air flowing through said second air passage comprises second means for operating, said second means for operating comprises means for rotating said first body portion relative to said second body portion to move said first connecting passage relative to said first and second openings to vary an opening amount of said first air passage.

6. The printing press according to claim **5**, wherein:

said valve means further comprise means for axially positioning said cylindrical body with respect to said first means for operating to partially open said first air passage with said second air passage closed;

said first and second connecting passages are each disposed substantially diametrically through said cylindrical body;

said first and second openings are disposed substantially diametrically with respect to one another on said housing;

said third and fourth openings are disposed substantially diametrically with respect to one another on said housing;

said means for rotatably connecting comprises bolt means extending from one of said first body portion and said second body portion and a threaded opening on the other of said first body portion and said second body portion to receive said bolt means therein;

said means for inhibiting rotation comprises pin means extending from one of said housing and said second body portion and slot means in the other of said housing and said second body portion for receiving said pin means therein;

said first means for operating comprises a pneumatic cylinder; and

said second means for operating comprises a motor, said motor having a rotatable shaft, and said rotatable shaft additionally comprising a transmission for transmitting rotational movement to said first body portion.

7. The printing press according to claim **6**, wherein:

said pneumatic cylinder comprises a piston rod extending therefrom, said pneumatic cylinder and said piston rod defining a longitudinal axis;

said longitudinal axis of said pneumatic cylinder being disposed in alignment with said longitudinal axis of said cylindrical body;

said piston rod having a first end disposed away from said pneumatic cylinder;

said second body portion comprises a threaded member extending therefrom towards said pneumatic cylinder;

said first end of said piston rod comprises a threaded nut for engaging said threaded member of said second body portion for moving said second body portion during moving of said pneumatic cylinder;

said means for axially positioning said cylindrical body with respect to said first means for operating comprises said threaded nut and said threaded member, whereby rotation of said threaded nut axially displaces said threaded member;

said second means for operating further comprises a potentiometer driven by said rotatable shaft of said motor for measuring rotational movement/of said motor;

said rotatable shaft further comprising a handwheel for manually turning said rotatable shaft;

said transmission comprising a first gear disposed on said rotatable shaft, and a second gear disposed on said first body portion and meshing with said first gear;

said second gear being non-rotatably connected to said first body portion for movement of said first body portion with movement of said second gear; and

said means for inputting air additionally comprises an air bypass for bypassing air around said valve means when said first air passage is closed; and

said air bypass comprises an additional valve means for adjusting an amount of air bypassing said valve means.

8. The printing press according to claim **4**, wherein:

said cylindrical body defines a longitudinal axis, and said cylindrical body comprises:

a one-piece integral member comprising both said first connecting passage, and said second connecting passage, said at least one solid element comprises said one-piece integral member;

said first means for operating comprises means for rotating said cylindrical body within said bore; and

said means for varying an amount of air flowing through said first air passage substantially independently of air flowing through said second air passage comprises second means for operating, said second means for operating comprises means for axially displacing said cylindrical body to move said first connecting passage relative to said first and second openings to vary an opening amount of said first air passage.

9. The printing press according to claim **8**, wherein:

said first and second connecting passages are each disposed substantially diametrically through said cylindrical body and said first and second connecting passages are disposed spaced apart axially along said cylindrical body;

said first and second openings are disposed substantially diametrically with respect to one another on said housing;

said third and fourth openings are disposed substantially diametrically with respect to one another on said housing;

said first means for operating comprises a motor, said motor having a rotatable shaft, and said rotatable shaft additionally comprising a transmission for transmitting rotational movement to said first body portion; and

said second means for operating comprises a pneumatic cylinder.

10. The printing press according to claim **9**, wherein:

said third and fourth openings comprise oblong slots, the oblong slots having a longitudinal dimension, and the longitudinal dimension being disposed parallel to the

longitudinal axis of said housing, said oblong slots being configured for maintaining said second air passage substantially open during axial movement of said cylindrical body to adjust air flow through said first air passage;

said pneumatic cylinder comprises a piston rod extending therefrom, said pneumatic cylinder and said piston rod defining a longitudinal axis;

said longitudinal axis of said pneumatic cylinder being disposed in alignment with said longitudinal axis of said cylindrical body;

said piston rod having a first end disposed away from said pneumatic cylinder;

said first end of said piston rod comprises means for engaging said cylindrical body for moving said cylindrical body during moving of said pneumatic cylinder;

said first means for operating further comprises a potentiometer driven by said rotatable shaft of said motor for measuring rotational movement of said motor;

said printing press further comprises at least one remote control panel for operating said first and second means for operating and monitoring said potentiometer;

said rotatable shaft further comprising a handwheel for manually turning said rotatable shaft;

said transmission comprises a first gear disposed on said rotatable shaft, and a second gear disposed on said first body portion, said second gear meshing with said first gear;

said second gear being non-rotatably connected to said cylindrical body for moving said first body portion during moving of said second gear;

said means for inputting air additionally comprises an air bypass for bypassing air around said valve means when said first air passage is closed; and

said air bypass comprises an additional valve means for adjusting an amount of air bypassing said valve means.

11. In a printing press comprising:

a free, a plate cylinder rotatably mounted on said frame, said plate cylinder for positioning a printing plate thereon, dampening means for applying dampening medium to said printing plate, an ink reservoir for holding a supply of ink, an inking mechanism for transferring the ink between said ink reservoir and said plate cylinder at least during operation of said printing press, said inking mechanism comprising a plurality of inking rollers, at least one ink fountain roller, and at least one ink transfer roller for transferring ink between said ink fountain roller and at least one of said plurality of inking rollers, sheet feeding means for feeding sheets of printing stock into the printing press from a stack of printing stock, the stack having a top for supplying sheets therefrom, a rubber blanket cylinder having a rubber blanket disposed thereabout for receiving an ink impression from the plate cylinder, a sheet drum for receiving sheets being fed for printing the ink impression of the rubber blanket onto the sheets, and sheet delivery apparatus for receiving printed sheets and stacking the printed sheets;

means for controlling air flow of the sheet feeding means, the sheet feeding means having means for providing input air thereinto and means for removal of exhaust air therefrom, said means for controlling comprising:

valve means for controlling air flow through said means for providing input air and said means for removal of exhaust air;

said valve means comprising:

a first valve portion for controlling flow of air through said means for providing input air, said first valve portion having at least an open configuration for passage of air therethrough and a closed configuration for blocking passage of air therethrough;

a second valve portion for controlling flow of air through said means for removal of exhaust air, said second valve portion having at least an open configuration for passage of air therethrough and a closed configuration for passage of air therethrough;

at least one solid element connecting at least a portion of said first valve portion to at least a portion of said second valve portion for substantially simultaneously moving both of said at least a portion of said first valve portion and said at least a portion of said second valve portion between at least the open configuration and the closed configuration;

single operating means for operating all of said at least a portion of said first valve portion, said at least a portion of said second valve portion and said at least one solid element substantially simultaneously to substantially simultaneously open both said first and second valve portion and substantially simultaneously close said first and second valve portion; and

means for operating said first valve portion substantially independently of said second valve portion for varying an amount of air flowing through said first valve portion substantially independently of the amount of air flowing through said second valve portion.

12. The means for controlling according to claim **11**, wherein said valve means comprises:

a valve housing having first and second openings for defining a first air passage of said means for providing input air, and third and fourth openings for defining a second air passage of said means for removal of exhaust air;

a valve body for being disposed in said valve housing, said valve body comprising a first connecting passage for connecting said first and second openings, and a second connecting passage for connecting said third and fourth openings;

said first valve portion comprises said first and second openings and said first connecting passage;

said second valve portion comprises said third and fourth openings and said second connecting passage;

said single operating means being for moving said valve body within said valve housing to:

move said first connecting passage into at least partial alignment with said first and second openings to at least partially open said first air passage, and to substantially simultaneously move said second connecting passage into at least partial alignment with said third and fourth openings to at least partially open said second air passage; and

move said first connecting passage substantially out of alignment with said first and second openings to at least substantially close said first air passage, and to substantially simultaneously move said second connecting passage substantially out of alignment with said third and fourth openings to at least substantially close said second air passage.

13. The means for controlling according to claim 12, wherein:

said valve housing has an exterior and defines a longitudinal axis;

said valve housing comprises a bore along said longitudinal axis;

said first, second, third and fourth openings being disposed through said housing from said exterior to said bore;

said valve body comprises a cylindrical body for being movably disposed within said bore;

said first and second connecting passages respectively comprise first and second bores within said cylindrical body; and

said means for operating comprises means for moving said cylindrical body within said bore to at least partially open and at least substantially close said first and second air passages.

14. The means for controlling according to claim 13, wherein:

said means for operating comprises first means for operating, and said first means for operating comprises one of:

means for rotating said cylindrical body within said bore; and

means for axially displacing said cylindrical body along the longitudinal axis of said bore.

15. The means for controlling according to claim 14, wherein:

said cylindrical body defines a longitudinal axis, and said cylindrical body comprises:

a first body portion comprising said first connecting passage;

a second body portion comprising said second connecting passage, said first body portion being axially disposed with respect to said second body portion along said longitudinal axis of said cylindrical body;

said at least one solid element comprises means for rotatably connecting said first body portion to said second body portion for relative rotational movement between said first body portion and said second body portion;

said first means for operating comprises means for axially displacing said cylindrical body within said bore;

said valve means further comprises means for inhibiting rotation of said second body portion; and

said means for operating said first valve portion substantially independently of said second valve portion for varying an amount of air flowing through said first air passage substantially independently of air flowing through said second air passage comprises second means for operating, said second means for operating comprises means for rotating said first body portion relative to said second body portion to move said first connecting passage relative to said first and second openings to vary an opening amount of said first air passage.

16. The means for controlling according to claim 15, wherein:

said valve means further comprise means for axially positioning said cylindrical body with respect to said first means for operating to partially open said first air passage with said second air passage closed;

said first and second connecting passages are each disposed substantially diametrically through said cylindrical body;

said first and second openings are disposed substantially diametrically with respect to one another on said housing;

said third and fourth openings are disposed substantially diametrically with respect to one another on said housing;

said means for rotatably connecting comprises bolt means extending from one of said first body portion and said second body portion end a threaded opening on the other of said first body portion and said second body portion to receive said bolt means therein;

said means for inhibiting rotation comprises pin means extending from one of said housing and said second body portion and slot means in the other of said housing and said second body portion for receiving said pin means therein;

said first means for, operating comprises a pneumatic cylinder; and

said second means for operating comprises a motor, said motor having a rotatable shaft, and said rotatable shaft additionally comprising a transmission for transmitting rotational movement to said first body portion.

17. The means for controlling according to claim 16, wherein:

said pneumatic cylinder comprises a piston rod extending therefrom, said pneumatic cylinder and said piston rod defining a longitudinal axis;

said longitudinal axis of said pneumatic cylinder being disposed in alignment with said longitudinal axis of said cylindrical body;

said piston rod having a first end disposed away from said pneumatic cylinder;

said second body portion comprises a threaded member extending therefrom towards said pneumatic cylinder;

said first end of said piston rod comprises a threaded nut for engaging said threaded member of said second body portion for moving said second body portion during moving of said pneumatic cylinder;

said means for axially positioning said cylindrical body with respect to said first means for operating comprises said threaded nut and said threaded member, whereby rotation of said threaded nut axially displaces said threaded member;

said second means for operating further comprises a potentiometer driven by said rotatable shaft of said motor for measuring rotational movement of said motor;

said rotatable shaft further comprising a handwheel for manually turning said rotatable shaft;

said transmission comprising a first gear disposed on said rotatable shaft, and a second gear disposed on said first body portion and meshing with said first gear;

said second gear being non-rotatably connected to said first body portion for movement of said first body portion with movement of said second gear; and

said means for inputting air additionally comprises an air bypass for bypassing air around said valve means when said first air passage is closed; and

said air bypass comprises an additional valve means for adjusting an amount of air bypassing said valve means.

18. The means for controlling according to claim 14, wherein:

said cylindrical body defines a longitudinal axis, and said cylindrical body comprises:

a one-piece integral member comprising both said first connecting passage, and said second connecting passage, said

at least one solid element comprises said one-piece integral member;

said first means for operating comprises means for rotating said cylindrical body within said bore; and

said means for operating said first valve portion substantially independently of said second valve portion for varying an amount of air flowing through said first air passage substantially independently of air flowing through said second air passage comprises second means for operating, said second means for operating comprises means for axially displacing said cylindrical body to move said first connecting passage relative to said first and second openings to vary an opening amount of said first air passage.

19. The means for controlling according to claim **18**, wherein:

said first and second connecting passages are each disposed substantially diametrically through said cylindrical body and said first and second connecting passages are disposed spaced apart axially along said cylindrical body;

said first and second openings are disposed substantially diametrically with respect to one another on said housing;

said third and fourth openings are disposed substantially diametrically with respect to one another on said housing;

said first means for operating comprises a motor, said motor having a rotatable shaft, and said rotatable shaft additionally comprising a transmission for transmitting rotational movement to said first body portion; and

said second means for operating comprises a pneumatic cylinder.

20. The means for controlling according to claim **19**, wherein:

said third and fourth openings comprise oblong slots, the oblong slots having a longitudinal dimension, and the longitudinal dimension being disposed parallel to the longitudinal axis of said housing, said oblong slots being configured for maintaining said second air passage substantially open during axial movement of said cylindrical body to adjust air flow through said first air passage;

said pneumatic cylinder comprises a piston rod extending therefrom, said pneumatic cylinder and said piston rod defining a longitudinal axis;

said longitudinal axis of said pneumatic cylinder being disposed in alignment with said longitudinal axis of said cylindrical body;

said piston rod having a first end disposed away from said pneumatic cylinder;

said first end of said piston rod comprises means for engaging said cylindrical body for moving said cylindrical body during moving of said pneumatic cylinder;

said first means for operating further comprises a potentiometer driven by said rotatable shaft of said motor for measuring rotational movement of said motor;

said printing press further comprises et least one remote control panel for operating said first and second means for operating and monitoring said potentiometer;

said rotatable shaft further comprising a handwheel for manually turning said rotatable shaft;

said transmission comprises a first gear disposed on said rotatable shaft, and a second gear disposed on said first body portion, said second gear meshing with said first gear;

said second gear being non-rotatably connected to said cylindrical body for moving said first body portion during moving of said second gear;

said means for inputting air additionally comprises an air bypass for bypassing air around said valve means when said first air passage is closed; and

said air bypass comprises an additional valve means for adjusting an amount of air bypassing said valve means.

* * * * *

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Nov. 9, 1943. T. A. TERRY 2,333,962

INKING CONVERTER UNIT FOR JOB PRINTING PRESSES AND THE LIKE

Filed Nov. 2, 1940 6 Sheets-Sheet 1

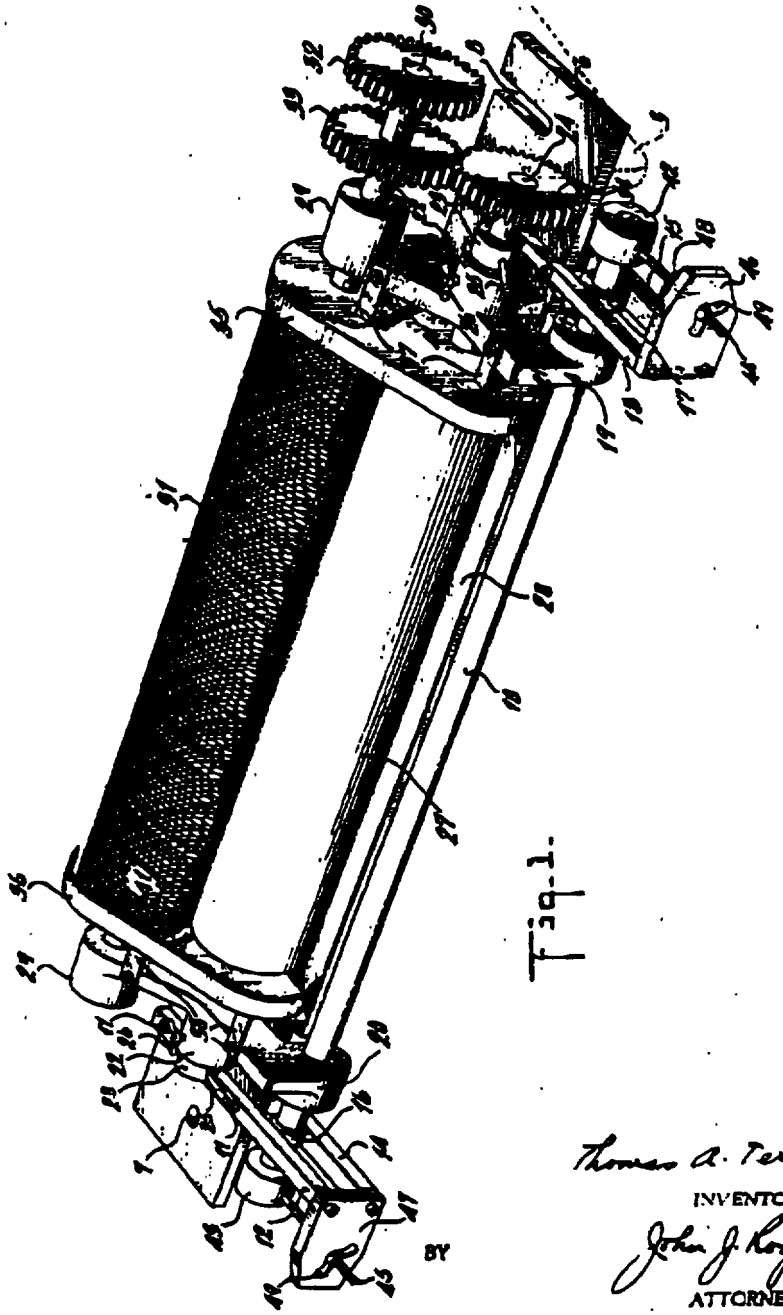

Fig. 1.

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Nov. 9, 1943. T. A. TERRY 2,333,962

INKING CONVERTER UNIT FOR JOB PRINTING PRESSES AND THE LIKE

Filed Nov. 2, 1940 6 Sheets-Sheet 2

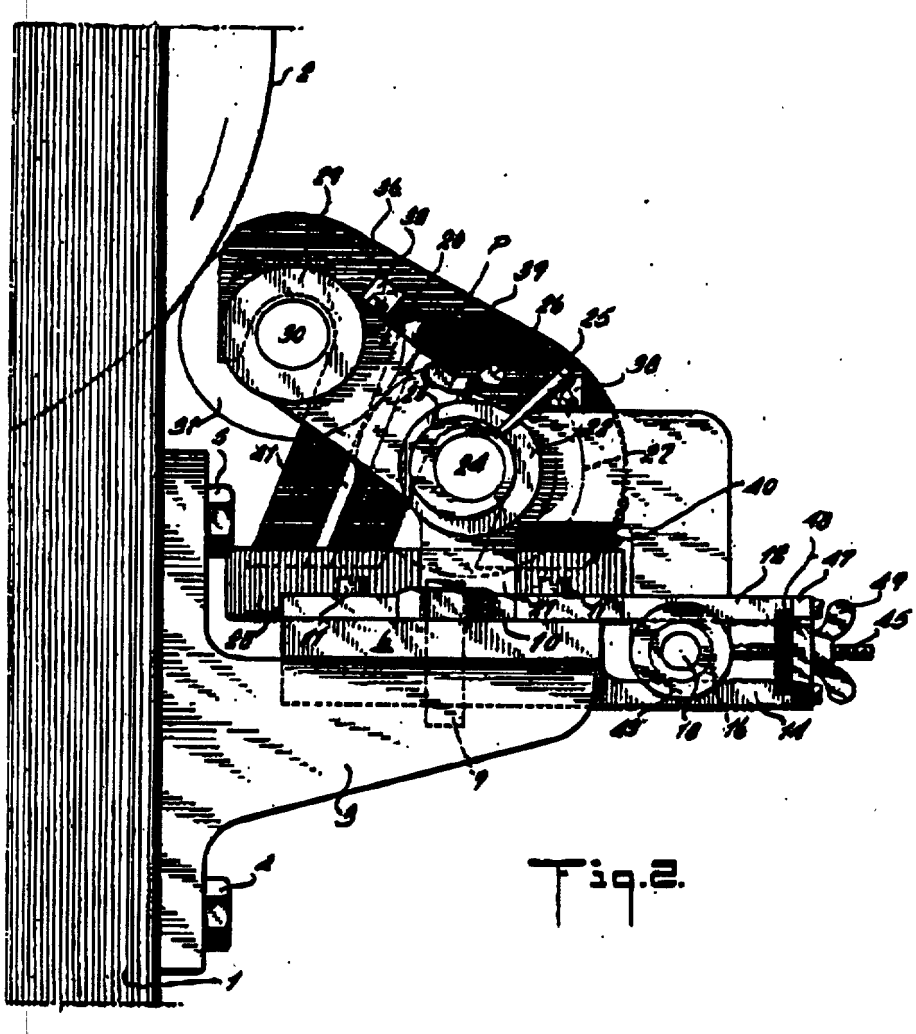

Fig. 2.

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INKING CONVERTER UNIT FOR JOB PRINTING PRESSES AND THE LIKE

Filed Nov. 2, 1940 6 Sheets-Sheet 3

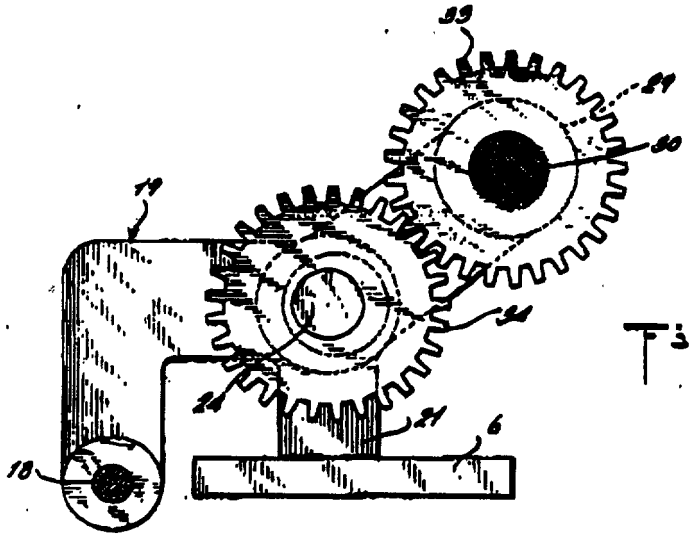

Fig. 3.

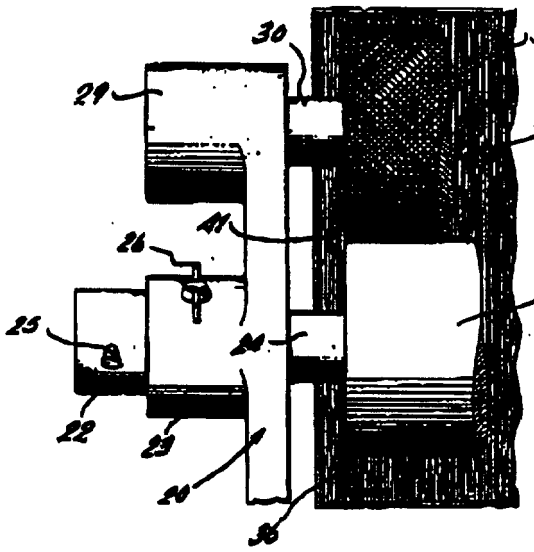

Fig. 4.

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INKING CONVERTER UNIT FOR JOB PRINTING PRESSES AND THE LIKE

Filed Nov. 2, 1940 6 Sheets-Sheet 4

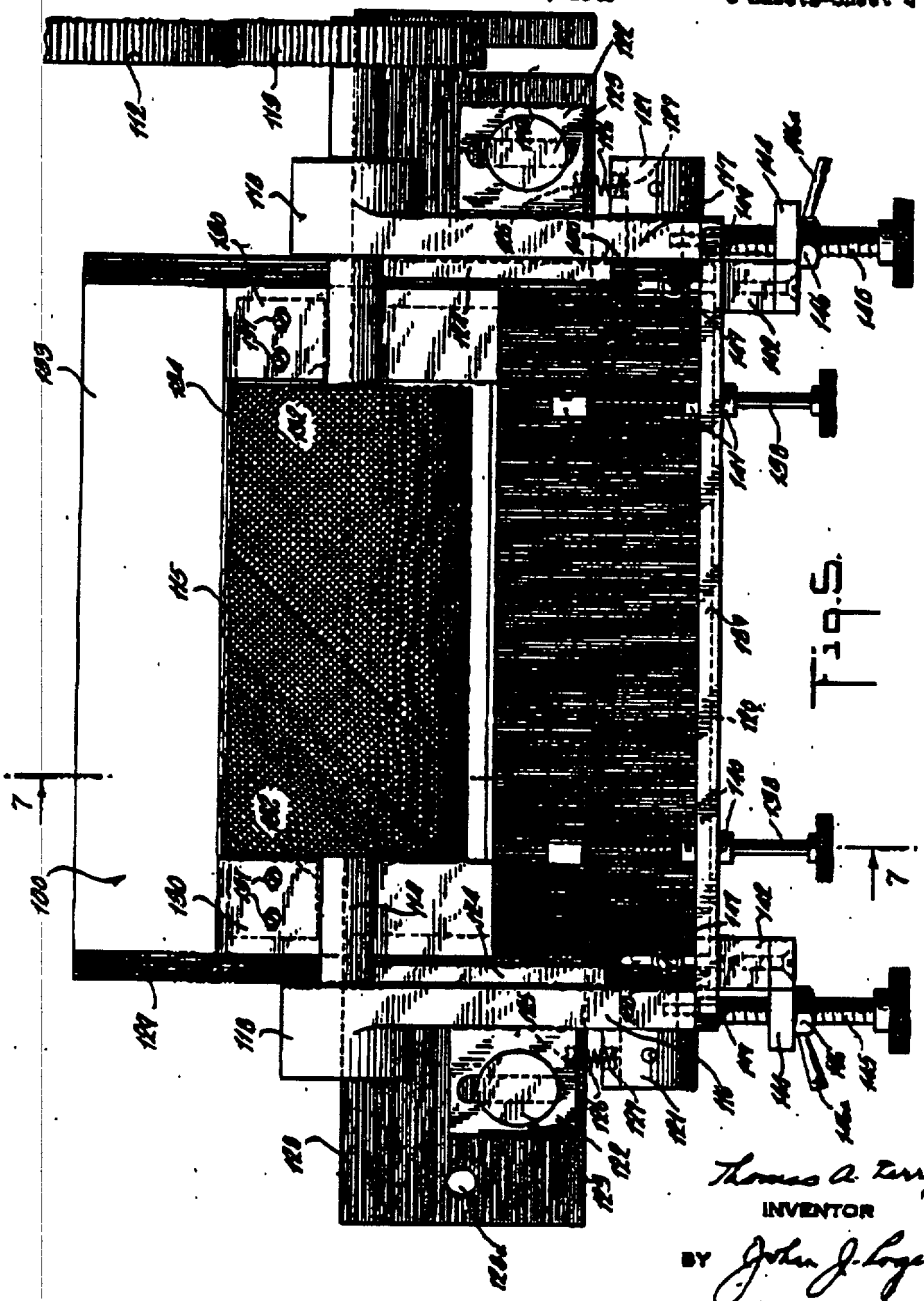

Fig. 5.

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INKING CONVERTER UNIT FOR JOB PRINTING PRESSES AND THE LIKE

Filed Nov. 2, 1940 6 Sheets-Sheet 5

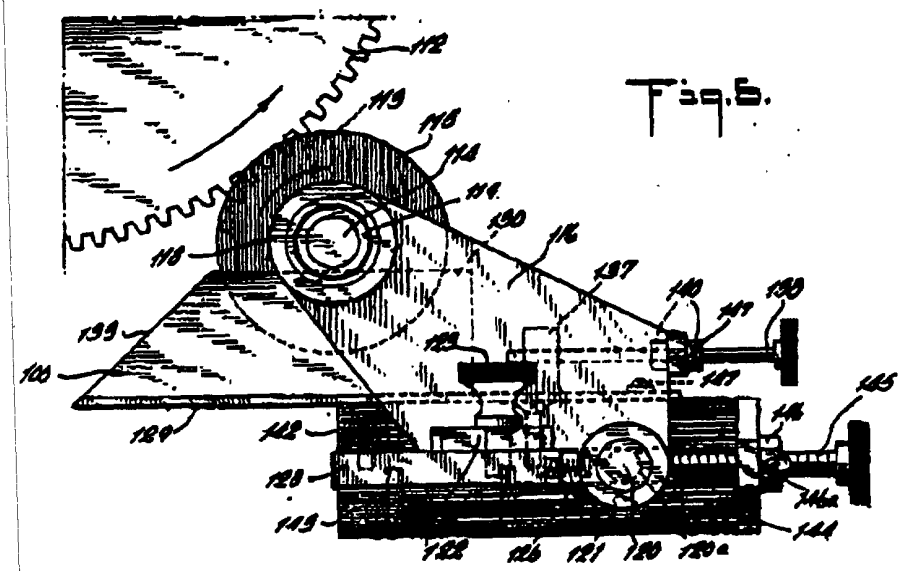

Fig. 5.

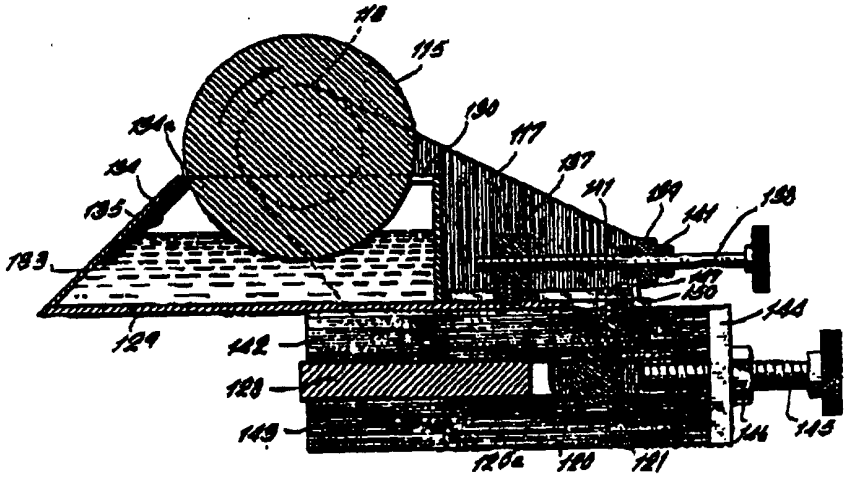

Fig. 7.

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INKING CONVERTER UNIT FOR JOB PRINTING PRESSES AND THE LIKE

Filed Nov. 2, 1940 6 Sheets-Sheet 6

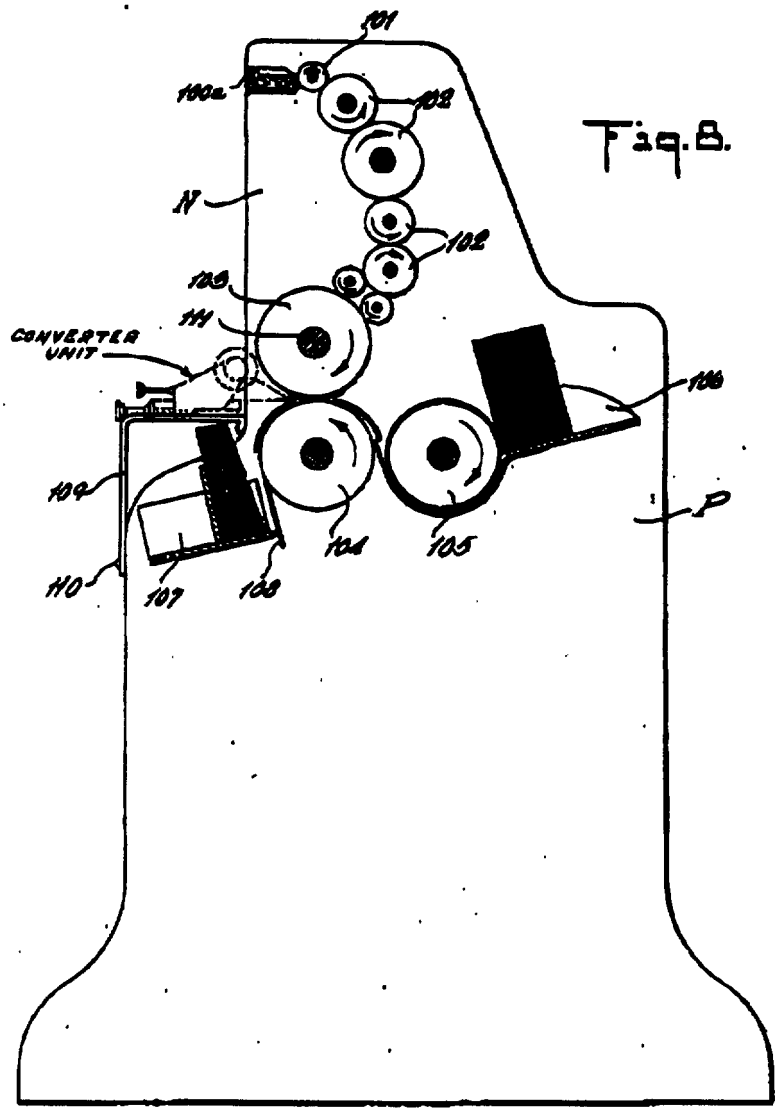

Fig. 8.

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Patented Nov. 9, 1943 2,333,962

UNITED STATES PATENT OFFICE

2,333,962

INKING CONVERTER UNIT FOR JOB PRINTING PRESSES AND THE LIKE

Thomas A. Terry, Brooklyn, N. Y.

Application November 2, 1940, Serial No. 363,961

6 Claims. (Cl. 101—351)

This invention relates to printing machines and more especially to a unitary attachment for converting printing presses of the ordinary printer's ink or oil ink type to presses employing ink of a volatile fast drying type.

Heretofore in printing machines of the job-printing type, it has been customary to employ so-called job-printing ink which, because of its chemical and physical characteristics including its high viscosity and low volatility, requires a complicated system of feed and applicator rollers for working the ink and transferring it from the fountain to the final printing roller in order to insure that the ink has the proper consistency and uniformity at the printing point. As an example of a typical press which involves such a conventional ink feed and roller construction, reference may be had to the press which is sold in the trade under the designation "Harris type F2" manufactured by the Harris Seybold Potter Company, of Cleveland, Ohio. Entirely apart from the relatively complex ink feed and roller structure of these conventional job-printing presses, is the fact that the finished work requires a comparatively long time for drying. In most cases, a delay of twenty-four hours is necessary before the printing ink is sufficiently dry so that the work can be used or transferred to another point for supplementary work such as folding or the like. Because of this great delay, the unit cost of printing with such machines is materially increased.

While various attempts have been made heretofore to adapt conventional job-printing presses to the use of fast drying inks, these attempts have not been successful because of the complicated ink feed roller arrangements which allows the volatile materials of the ink to dry out before reaching the printing roller. Furthermore in some cases it is desirable to be able to use such conventional job-printing presses either with jobber's ink or with fast drying inks. Accordingly, it is a principal object of this invention to provide a simple, cheap and highly efficient converter unit which can be readily attached to existing job-printing presses whereby such presses can be converted rapidly to operate with fast drying inks.

Another principal object of this invention is to provide an inking device whereby job-printing and the like can be effected with a printing ink which dries substantially immediately after application. I have found that with this new device, it is possible to execute nearly all forms of commercial job-printing with fast drying inks, which inks consist of a volatile solvent or vehicle such as an alcohol with the appropriate pigment therein. However, in order to use such inks commercially, it is necessary to design ink-feed and applicator arrangements so that the characteristics of such inks are fully taken advantage of.

Consequently a feature of the invention is to provide a novel and efficient ink-feed arrangement for printing presses whereby inks of the fast drying type may be efficiently employed.

Another feature relates to an ink-feed arrangement using inks having a volatile vehicle or solvent, whereby the pressure and adjustment of the various rollers can be made with the requisite accuracy in conformance with the physical characteristics of the ink.

Another feature relates to an ink-feed arrangement employing fast drying inks whereby a uniformly engraved metal roller of hard metal such as steel or the like is used to transfer the ink directly to the printing or type roller.

Another feature relates to an ink-feed arrangement for use with fast drying inks wherein a pair of ink-feed rollers are employed in closely adjusted relation, together with a special housing for the rollers whereby the lodging of excess ink between the rollers is substantially eliminated.

A further feature relates to an ink-feed arrangement wherein one of the ink-feed rollers is provided with independent adjustments at opposite ends whereby the quantity of ink transferred to a printing roller can be caused in accordance with the closeness or openness of the printed subject matter at opposite margins or sections of the receiving surface.

A further feature relates to a unitary adaptor using fast drying inks designed for ready attachment to standard job-printing machines, wherein a single engraved ink-feed roller is mounted for adjustment toward and from the printing or type roller of existing multi-roller job printers.

A further feature relates to an adaptor unit for expeditious attachment to existing multi-roller job printers wherein a specially designed ink roller is used in conjunction with a doctor blade to accommodate the physical and chemical characteristics of fast drying inks.

A still further feature relates to the novel organization, arrangement and relative location of parts which constitute a simple, improved and highly efficient unitary volatile-ink feeding adaptor for printing presses, whereby printing can be done with fast drying inks such as those containing a pigment in a volatile solvent or vehicle such as an alcohol or the like.

Other features and advantages not specifically enumerated will be apparent after a consideration

of the following detailed descriptions and the appended claims.

In the drawings which show certain embodiments,

Fig. 1 is a perspective view of a unitary ink-feeding device of the dual roller type embodying features of the invention.

Fig. 2 is an end view of Fig. 1 showing the manner of attaching the device to a printing press.

Fig. 3 is an enlarged view of part of Fig. 1.

Fig. 4 is an enlarged view of another part of Fig. 1.

Fig. 5 is a top-plan view of another and preferred embodiment of the invention.

Fig. 6 is an end view of Fig. 5.

Fig. 7 is a sectional view of Fig. 5 taken approximately along the lines 7—7 thereof looking in the direction of the arrows.

Fig. 8 is a diagrammatic elevational end view of a typical job-printing press embodying the features of the invention.

Referring more particularly to Figs. 1 and 2, the numeral 1 represents the frame or spaced vertical uprights of any well-known form of printing press such for example as that known to the job-printing trade as the "Harris type P2" job printer. The printing or type roller 2 carrying the rubber printing plate, is driven in the direction of the arrow by the motor and gearing mechanism of the press which is of well-known construction. The unitary ink-feed adaptor according to the invention is adjustably supported on a pair of brackets 3 disposed at opposite sides of the printing machine and attached to the uprights 1 thereof, by suitable bolts 4, 5. The brackets 3 are spaced apart sufficiently to allow the inking attachment to be moved bodily as a unit into proper cooperative relation with type roller 2.

The inking arrangement comprises a flat metal main support 6 which has a hole 7 at one end and a slot 8 at the other end. Attached rigidly to each of the brackets 3 is a threaded pin 9, the left-hand pin 9 passing through the hole 7, while the right-hand pin engages in the slot 8 whereby the entire assembly can be swung around the left-hand pin and the longitudinal relation between the feed rollers and the type roller 2 can be readily adjusted. For this purpose, the nuts 10 are loosened and the support 6 which carries the inking arrangement is swung around pin 9 as a pivot whereupon both nuts 10 are tightened to fasten the assembly in adjusted position. Fastened adjacent the opposite ends of support 6 by means of screws 11, are two tracks or guides 12, 13. These guides are disposed above and in alignment with the guiding projections 14, 15, forming an integral part of the member 6. Members 12—14 and 13—15 thus define a guide track for the rollers 16 and 17 which are loose on shaft 18. Fastened adjacent opposite ends of shaft 18 are a pair of metal castings 19, 20, shown in an enlarged form in Fig. 3. Each of the members 19, 20, is provided with a downwardly extending lug 21 which has a smooth flat machined underface resting on and adapted to slide on member 6. Each member 19, 20, also carries an integral bearing bracket 22 which is provided with an eccentric opening to receive the rotatably adjustable bearing sleeve 23, in which the ends of shaft 24 are journalled. Affixed to each sleeve 23 is an adjusting handle 25 whereby the sleeves may be independently rotated to vary the position of the ends of shaft 24 with respect to shaft 18. After being properly adjusted, the sleeves 23 are locked in position by suitable wing-nutted set screws 26.

Rigidly fastened to shaft 24 is a fountain roller 27 which, in accordance with the invention, is of a smooth hard and impervious material such as polished metal or ceramic, and is adapted to rotate while partially immersed in the ink contained in the pan or reservoir 28 which is supported on member 6. Each of the members 19, 20, also has another integral bearing bracket 29 to receive the ends of shaft 30 to which is fastened the applicator roller 31 of hard metal such as steel or the like. In accordance with the invention, the roller 31 has its surface etched or engraved to provide a substantially uniformly reticulated surface. Preferably, the fineness of the engraving should on the average not exceed that corresponding to a 200 mesh screen and should not be coarser than that corresponding to a 100 mesh screen. I have found that by limiting the screen engraving within the above limits and by using the etched roller for the transfer of the quick drying ink to the printing or type roller, satisfactory results are obtained with fast drying inks of the type employing a volatile vehicle such as alcohol or the like. Preferably, the ink should be in the form of a pigment suspension in the solvent although it will be understood that it is within the compass of the invention to employ so-called colloidal solutions of pigment such as carbon-black, graphite, etc., in a volatile vehicle. A pigment ink that may be satisfactorily used is that sold under the trade name "Anflex" by International Printing Ink Company. Roller 31 is driven by a gear 32 which in turn is driven in suitable timed relation to the gear which drives the type roller 2. Shaft 30 also has keyed thereto a gear wheel 33 which meshes with gear wheel 34 keyed to shaft 24. Preferably, the teeth of gears 33 and 34 are made long and deep enough so that they maintain their proper driving relation in all adjusted positions of roller 27.

Rollers 27 and 31 are provided with a protective housing comprising the end plates 35, 36, which are fastened by brackets 37, 38, to the associated members 19, 20, and a cover plate 39 is hinged to the end plates 35, 36, by suitable hinges 40. The said cover plate is removed in Fig. 1 to show the rollers 27 and 31 more clearly.

As will be seen from Figs. 2 and 4, the rollers 27 and 31 are in very close contact, and since the ink supply is of the fast drying type consisting of a pigment or pigments suspended or colloidably dissolved in an alcohol or similar vehicle, the ink is of relatively low viscosity. Since the rollers are rotating in the direction of the arrows (Fig. 2), the excess ink would tend to form a pool in the trough-like region P between the rollers. In order to prevent this accumulation of ink, the rollers have their flat ends in close proximity to and preferably in contact with the end plates 35, 37, as shown more clearly in Fig. 4. Each of said end plates is formed or provided with an inclined groove or channel 41 which extends upwardly beyond the region P between the rollers 27, 31, and also extend downwardly into the pan 28. I have found that by this arrangement excess ink is prevented from lodging between the rollers and is returned directly through channels 41 to the ink reservoir 28. In order to adjust the spacing relation between the transfer roller 31 and type roller 2, shaft 18 has fastened

thereto at its opposite ends the members 42, 43. Fastened to members 42, 43, are the threaded arms 44, 45, which pass through openings in the corresponding plates 46, 47 fastened to members 13—15, 13—14. The position of shaft 18 and consequently the position of the entire inking unit is adjustable by loosening the lock-nuts 48 and wing-nuts 49 whereby the positions of the ends of shaft 18 may be independently adjusted whereupon the nuts 48 and 49 may be tightened to lock the assembly in its adjusted position with respect to the type roller.

I have found that when inks of the fast drying type employing a volatile vehicle such as an alcohol are employed, very frequently it becomes necessary to adjust with precision not only the pressure between the impervious fountain roller 27 and the applicator roller 31, but also the pressure or spacing between the applicator roller 31 and the printing roller 2. Furthermore, it may be necessary in certain kinds of printed subject matter to have the pressure or spacing between the rollers different from one end to the other. For example, the margin on one side of the printed sheet or surface may have dense or close printing, while the other margin may have relatively open or little printing. Because of the low viscosity and high flowability of the fast drying inks, it is desirable under such circumstances to provide a greater quantity of ink at one end of the type roller. For this reason, the independent adjustments are provided for each end of roller 27 with respect to roller 31, this adjustment being effected by the independently adjustable eccentric bearing sleeves 38 at each end of shaft 26. Likewise, the independent adjustment for each end of the roller 31 with respect to the printing roller 2 is provided by members 44, 45.

Referring to Figs. 5 to 8, there is shown a preferred modification of Figs. 1 to 4 wherein the fountain roller 27 is provided with a specially designed doctor blade, and the manner of adjusting the various parts is somewhat modified. The unit according to this preferred embodiment comprises an ink box or fountain 100 having a bottom 128 which extends forwardly beyond the front wall of the box. The rear wall 134 of the box is inclined and has attached thereto the doctor blade 136 which, in accordance with the invention, is in the form of a vulcanized hard rubber strip of the order of hardness represented by 85 durometer. This doctor blade is rigidly clamped between the metal strip 138 and the wall 139 by screws so that the overhanging or effective lip 136a can be adjusted to take up for wear.

The extended bottom wall 128 has fastened thereto at opposite ends a pair of threaded posts 137 to receive the threaded shanks of corresponding adjusting screws 130. The ink box is supported on a flat main supporting member or bed plate 126 adapted to extend transversely across the front of the press adjacent the printing or type roller thereof. Bed plate 126 is provided with a perforation 126a at one end and a slot 126b at the other end whereby the entire unit can be removably attached to the frame of the printing press and whereby it can be pivoted around the pin or bolt which passes through the opening 126a so as to enable the unit to be cleaned or repaired without disturbing the press proper. Fastened in any suitable manner adjacent the ends of member 126 are flat metal bars 142, 143, which extend forwardly of the plate to define guide-ways for purposes to be described. The ink box rests for adjustable sliding movement on the upper members 142 and is locked in adjusted position by means of locking screws 147 which pass through slots 159 in member 126. The engraved or etched ink transfer roller 115 is fastened to a shaft 114 which is mounted in suitable journal bearings in the brackets 116 provided with retaining hubs to prevent longitudinal displacement of the shaft. Ink transfer roller 115 is, in accordance with the invention, of a hard material such as polished steel having a reticulated surface formed by etching or engraving with an average fineness preferably not exceeding 200 mesh and an average coarseness not exceeding 100 mesh as described above in connection with Figs. 1 to 4. Preferably the etched depressions are uniform in cross section. Instead of using an etched steel roller, a similar hard impervious and smooth-surfaced roller such as vitreous, ceramic or the like may be employed, the surface of the roller being etched or engraved in any well-known manner.

A gear 113 is affixed to shaft 114 and is in mesh with another gear 112 which forms part of the same driving mechanism which drives the various ink-feed rollers of the press such as the rollers 101 to 105 (Fig. 8) so that the etched inking roller 115 of the converter unit operates in proper direction and timed relation with respect to the printing or type roller 103 of the press on which the usual rubber printing plate is fastened, the direction of rotation being indicated by the arrows.

The bearing brackets 116 form part of a frame consisting of the side members or castings 116, 117, which are united at their forward ends by the rigid cross arm 130 and by shaft 126. Member 139 is provided with two openings through which pass the ink box adjusting screws 130. The castings 116, 117, have laterally extending integral lugs 123, each of which is formed with a slot through which passes the lock-nut fastening screws 123, the ends of which are threaded into plate 126.

In order to guide the ink box during its adjustable sliding movement, and to prevent it from tilting, the castings 116, 117, have integral lips 124 which define with the adjacent members 142 a channel or track in which the lateral ends of the member 128 ride. The end portions of the ink box are provided with cover members 139 to the rear portion of which are adjustably fastened by screws 131 the rubber wipers 132. Wipers 132 engage the flat ends of the roller 115 to prevent ink being carried upwardly thereby.

For the purpose of adjusting the position of the etched transfer roller 115 with respect to the printing or type roller 103 (Fig. 8) of the press, there are provided at opposite ends of the unit two threaded adjusting screws 145 which pass through corresponding threaded openings in the lugs 144 carried by members 142 and 143. The screws 145 are locked in place by suitable lock-nuts 146 preferably provided with their own adjusting handles 145a. The ends of screws 145 are adapted to butt against the front flat edges of the castings 116 and 117. Each of the castings 116, 117, is provided with a lateral integral hub 121 to receive the round shaft 126. Shaft 126 therefore passes between the guide members 142 and 143 at opposite ends of the unit and at these portions the shaft 126 is reduced in diameter so as to prevent lateral displacement of the frame carrying the roller 115 with respect to the remaining parts of the unit. The frame and roller 115 are nor-

mally urged to a forward position by means of a pair of compression springs 130 each of which has an end seated in a recess in the bed plate 128 and the opposite end seated in a corresponding recess in the hub 121.

With the foregoing arrangements, it is possible therefore to adjust the position of the ink box and therefore the position of the doctor blade 136a independently of the adjustment of the roller 115, while it is also possible to adjust the etched roller 118 and doctor blade and ink box as a unit. There is shown in Fig. 8 a diagrammatic side elevational view of a typical job-printing press of the type normally designed to employ a printing ink of low volatility such as the usual oil inks used in job printers. This type of press has the oil ink fountain 186a supported adjacent the top of the press frame. Located between the printing or type roller 183 are a series of ink working and distributing rollers 182 which are necessary in order to make sure that the ink from the fountain 186a has the proper consistency before it is actually applied to the type roller 183. Cooperating with the type roller 183 is an impression roller 184 and a feed roller 188 by means of which the envelopes or other blanks to be printed are carried from the inlet hopper 186 to the type roller and are discharged after printing into the receiving hopper 187. Presses of this general type are well-known in the art, of which the "Harris type F2" referred to hereinabove is typical. The converter unit of Figs. 5 to 7 is shown in dotted outline in Fig. 8 and the bed plate 128 of this unit is adapted to be removably fastened to a bracket 185 which is attached to the rear of the press by suitable bolts 119 so that the etched ink transfer roller 118 is in direct ink transfer engagement with the type roller 183.

By means of the single bed plate 128 which carries the entire unit, it is possible to attach this converter unit to existing presses in a very simple manner. When the bed plate 128 has been fastened, the nuts 148 are loosened and the screws 145 are turned so as to move the frame and etched roller 118 into proper relation with respect to the type roller 183. By means of the adjustments 145 at opposite ends of the unit, it is possible to regulate the pressure between the etched roller 118 and the type roller independently at opposite ends. When the roller 118 has been properly adjusted, the members 139 are adjusted causing the ink box and the doctor blade to move so as to provide the proper pressure between the edge 136a of the doctor blade and the edge cylinder 118. Here again by providing separate adjustments of each end of the unit, the pressure or clearances at the opposite ends of the doctor blade can be accurately regulated.

I have found that with arrangements such as those described employing the various individual pressure and spacing adjustments for the doctor member and the etched transfer roller, it is possible to use fast drying inks on the usual job-printing presses. I have also found that by using the inking arrangement as described, it is possible to effect job-printing with maximum speed since the ink dries substantially immediately. Furthermore, by using the particular arrangement and adjustment of parts as described above, sharper and more readily controlled printing may be effected and the machinery can be maintained in continuous use without clogging, a disadvantage which is always present with the ordinary job-printing press inks because such inks are of high viscosity and tackiness and relatively low volatility tend to accumulate dust.

The arrangement as described consists of a complete and self-contained unit which can be attached readily to a wide variety of presses. Furthermore, the arrangement provides the maximum in accuracy of adjustment and enables the entire unit to be pivoted or swung around the shaft 19 (Figs. 1–4) or around the axis of shaft 120 (Figs. 5–8) in a plane parallel to the axis of the printing roller, and also to be swung around an axis substantially perpendicular to the printing roller. This enables the inspection and operation of the printing to be readily supervised for repair, cleaning or the like.

It will be understood of course that various changes and modifications may be made in the particular embodiment disclosed without departing from the spirit and scope of the invention.

What I claim is:

1. A converter unit of the type described comprising a support for removable attachment to the frame of a printing press, an ink box slidably attached to said support, an ink transfer roller, a frame also slidably attached to said support and carrying said roller, a doctor blade fixedly mounted with respect to said box, means to adjust the transfer roller with respect to said box, and with respect to the printing roller, and means to adjust the doctor blade with respect to said transfer roller.

2. A converter unit according to claim 1 in which the means for adjusting the relation between the transfer roller and printing roller is independent of the means for adjusting the doctor blade with respect to the transfer roller.

3. A converter unit according to claim 1 in which the means to adjust the transfer roller with respect to the printing roller of the press includes a pair of springs located between said frame and said support normally tending to separate said transfer roller from said doctor blade, and a pair of adjustable stops carried by said support and engaging said frame to adjustably limit the spacing between the doctor blade and said single roller.

4. A unitary ink feeding assembly for attachment to a printing press of the type having a type roller, said assembly comprising an engraved polished metal inking roller, a flat main supporting member adapted to extend transversely across the front of the press, a rigid frame having lateral bearing supports for said roller and slidable toward and away from the press on said supporting member, an ink box movable as a unit with said frame, horizontal guides for said frame, and means to pivotally support said main supporting member with respect to the press adjacent one side thereof whereby said assembly can be swung through a horizontal angle for cleaning, inspection and the like.

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United States Patent

[11] 3,604,350

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[21] Appl. No. 818,647
[22] Filed Apr. 23, 1969
[45] Patented Sept. 14, 1971

[73] Assignee Lee Machinery Corporation
New York, N.Y.

[54] **FLEXOGRAPHIC PRESSES WITH INTERRUPTER AND CYLINDER REGISTER MECHANISMS**
8 Claims, 7 Drawing Figs.

[52] U.S. Cl. 101/181, 101/182, 101/247, 101/248, 101/351
[51] Int. Cl. B41f 5/16, B41f 31/30
[50] Field of Search 101/181, 182, 184, 185, 247, 248, 209, 351, 352, 206, 207; 74/31

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Primary Examiner—J. Reed Fisher
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ABSTRACT: A flexographic press having a plurality of printing stations with each station having an associated impression cylinder, a printing plate cylinder mounted for individual movement back and forth relative to its impression cylinder, and an ink fountain roller mounted for individual movement back and forth relative to its printing plate cylinder, and means for correcting the web registration between stations.

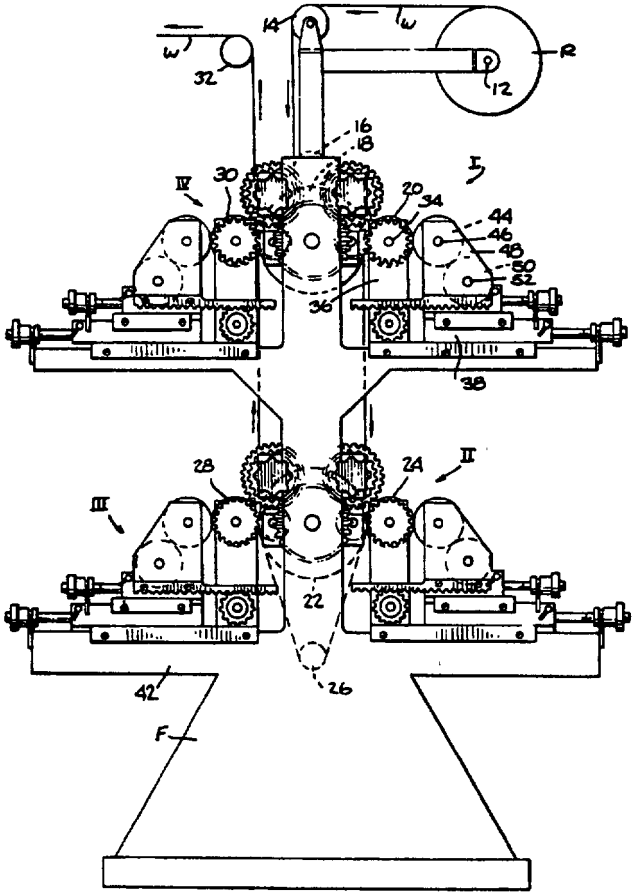

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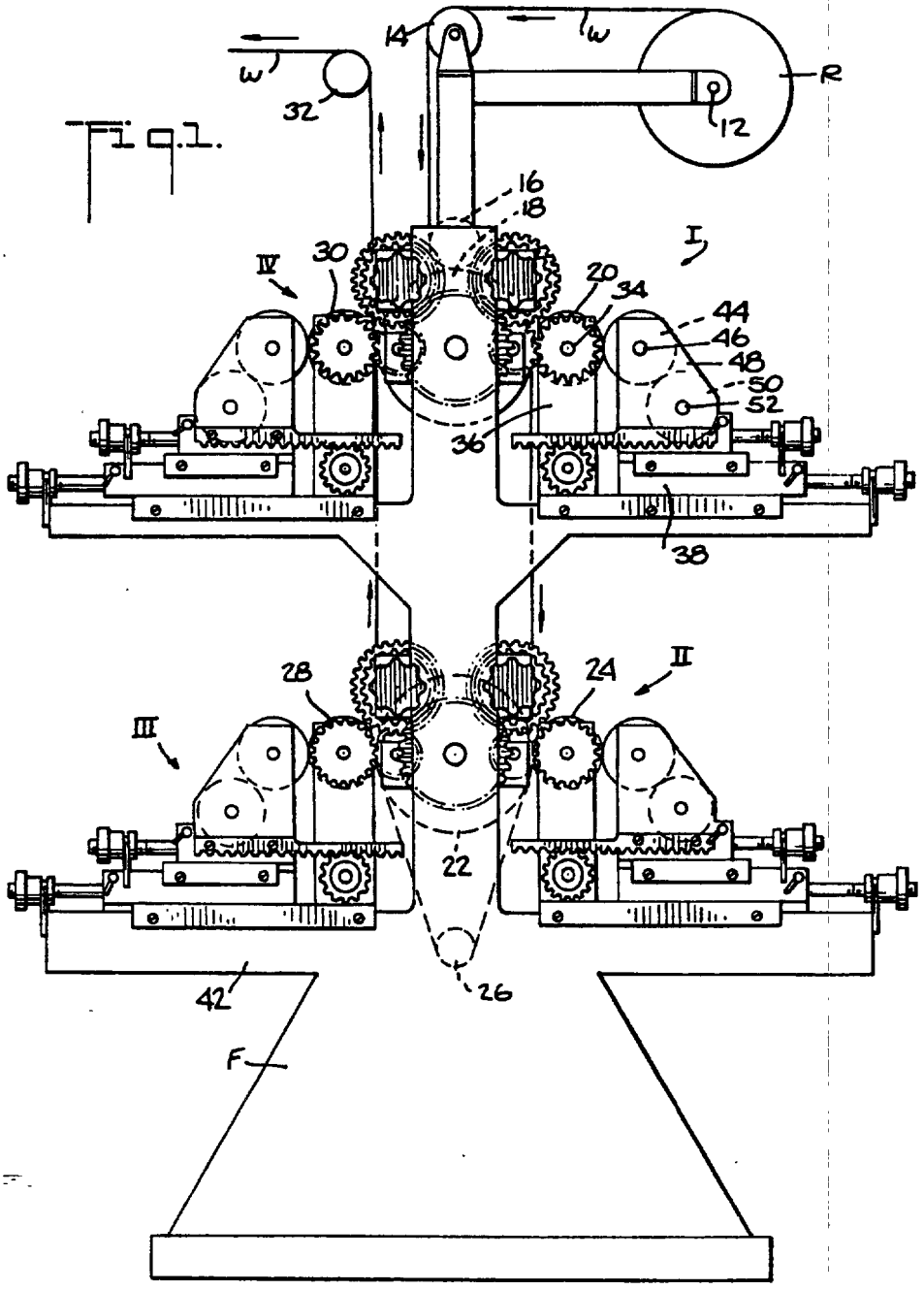
Fig. 1.



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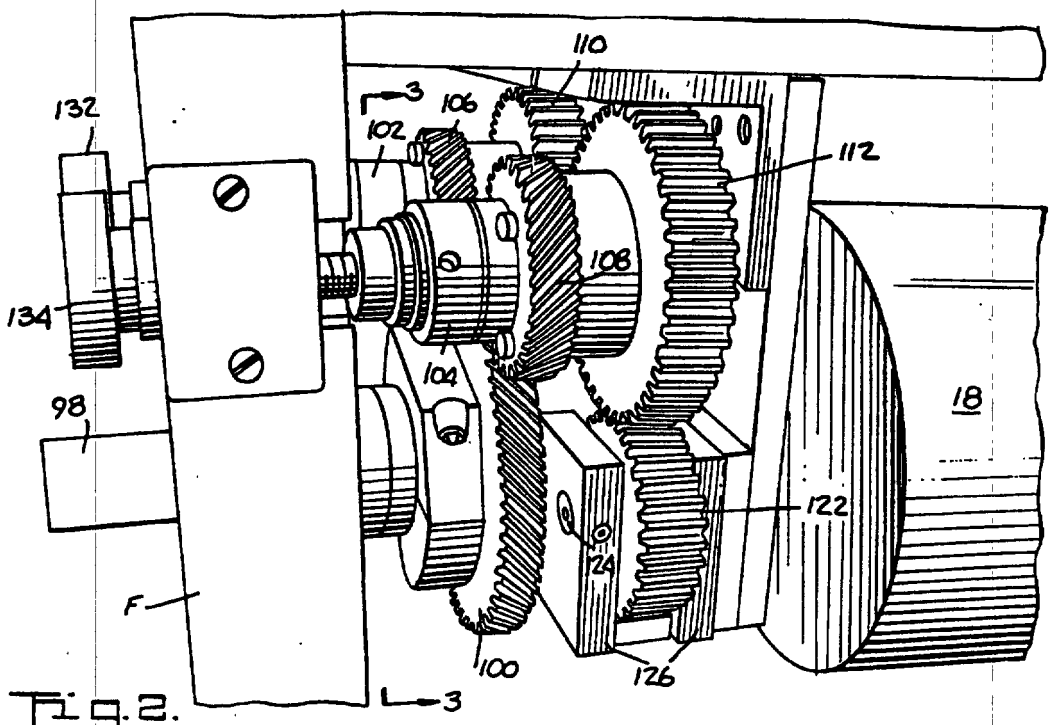

Fig. 2.

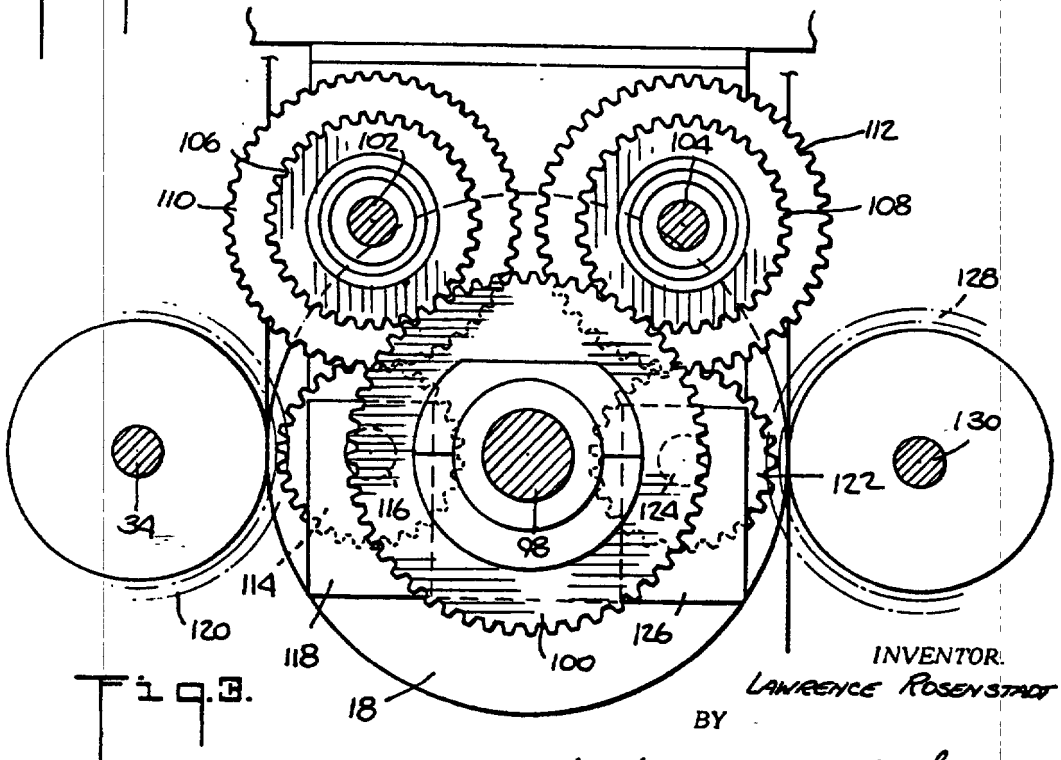

Fig. 3.

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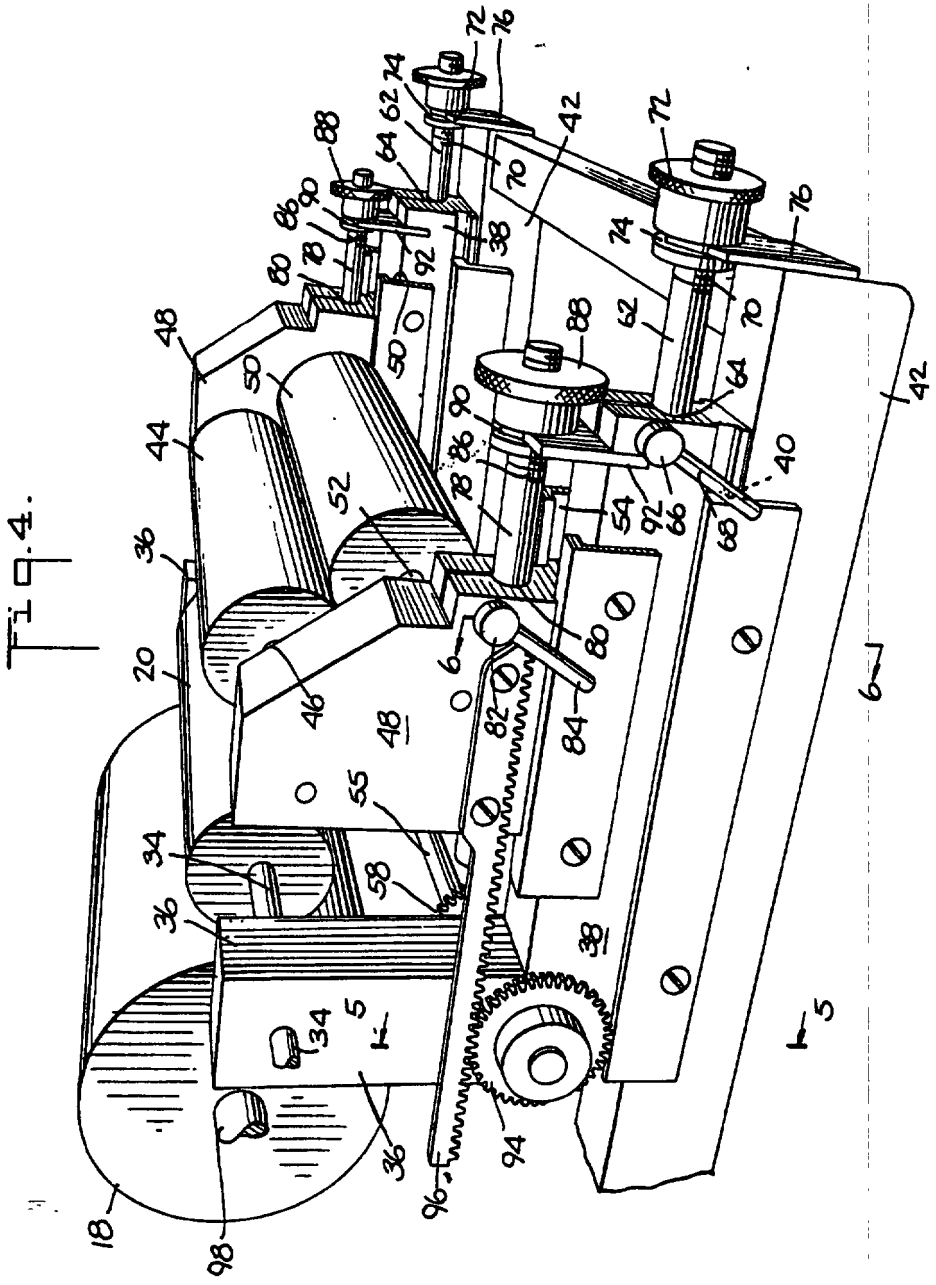

Fig. 4.

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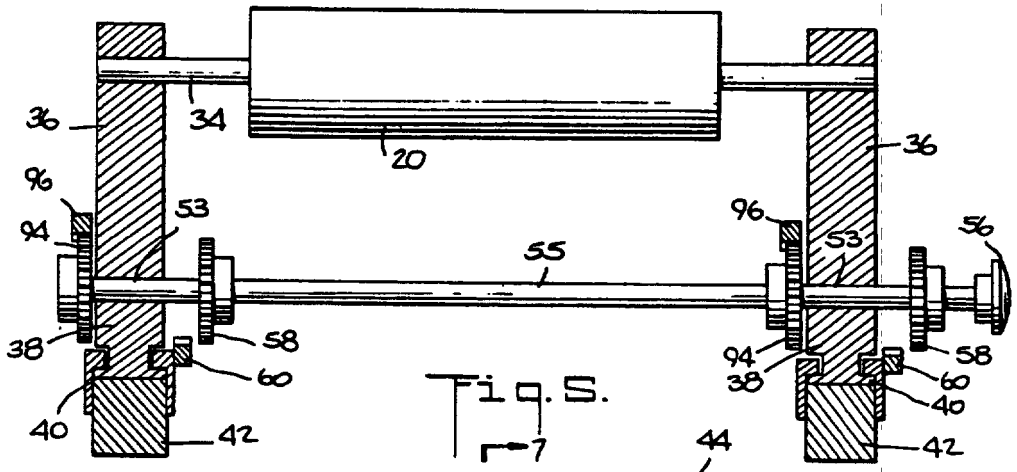

Fig. 5.

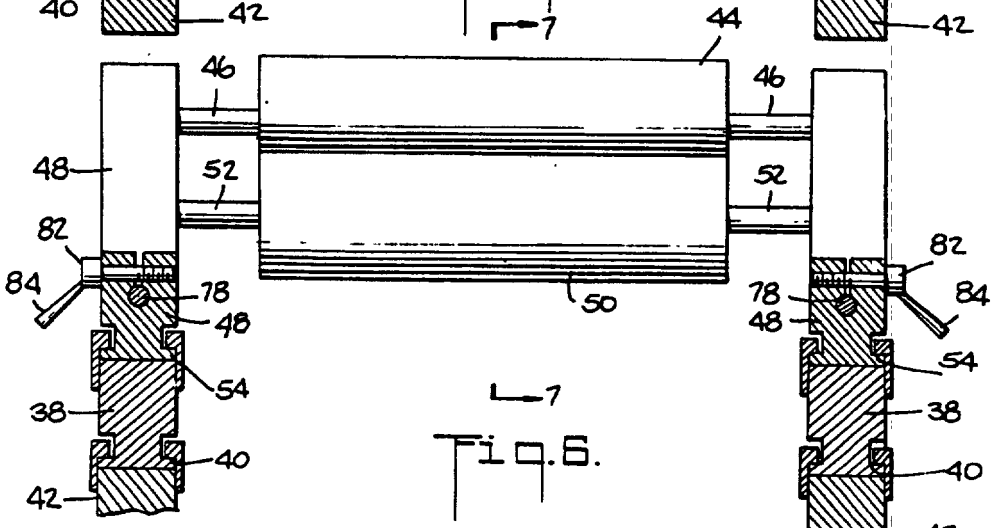

Fig. 6.

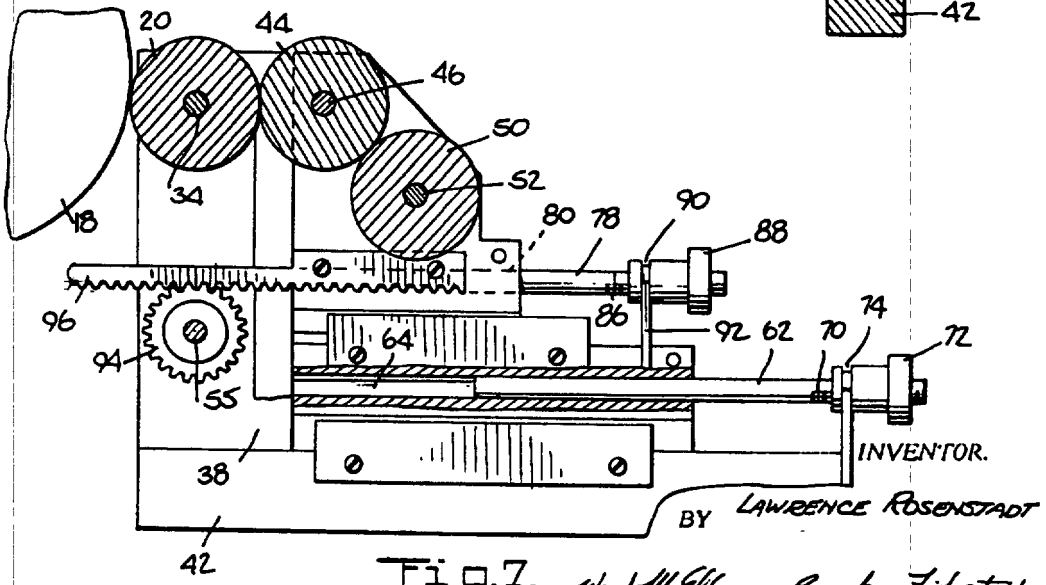

Fig. 7.

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FLEXOGRAPHIC PRESSES WITH INTERRUPTER AND CYLINDER REGISTER MECHANISMS

This invention relates to printing presses and more particularly to flexographic presses.

The type of printing known as flexography or aniline printing is a specialized form of relief printing used for printing on such materials as cellophane, polyethylene, or the like. This type of printing is generally characterized by the use of flexible rubber plates carried by the printing cylinders of web-fed rotary presses. Generally, the plates are inked by a single inking roller and the material to be printed is fed between the press plate cylinder and its associated impression cylinder.

It is usual for this type of flexographic press to print multiple colors with a plate cylinder, and a coacting impression cylinder associated with each particular color to be printed. Precise registration of the web between successive printing stations in a press of this nature is critical. Prior art means for controlling this registration is disclosed in U.S. Pat. No. 3,233,539 dated Feb. 8, 1966. The present invention concerns improvements upon the features of such apparatus.

Conventionally, flexographic presses of the class described include means for laterally moving the printing plate cylinder with respect to the impression cylinder as well as means for laterally moving the ink plate roller with respect to the printing plate cylinder. Prior art means for effecting such movements are disclosed in aforementioned Pat. No. 3,233,539. This invention is directed to improvements upon the features of the apparatus of the prior art.

Briefly my invention contemplates the provision of a flexographic press having a plurality of printing stations with each station having an ink fountain roller, a printing plate cylinder and a related impression cylinder. It will be understood that more than one printing plate cylinder may be associated with each impression cylinder and in the flexographic printing press illustrated, two such printing plate cylinders are normally associated with each impression cylinder. In each station, means are provided for mounting the printing plate cylinders for individual movement back and forth relative to its impression cylinder and means are provided for mounting each of the ink fountain rollers for individual movement back and forth relative to its printing plate cylinder. In addition, means are provided for correcting the web registration between stations.

In one form of my invention the means for mounting the printing plate cylinder include a printing plate cylinder shaft carrying the printing plate cylinder and a printing plate cylinder frame having upward extensions for carrying the printing plate cylinder. The press is provided with a crossarm having a keyway therein for slidably receiving the printing plate cylinder frame thereon. In addition, means are incorporated for providing course adjustments as well as vernier adjustments of the printing plate cylinder frame with respect to the impression cylinder, thereby insuring effective and rapid adjustment of the printing plate cylinder.

In another form of my invention, I provide means for mounting an ink fountain roller including an ink fountain roller shaft which carries the roller and which, in turn, is mounted on an ink fountain carriage. The printing cylinder frame is provided with a keyway for slidably receiving the carriage. Means are incorporated for providing course adjustments and vernier adjustments of the ink fountain carriages with respect to the printing cylinder frame, thereby insuring effective and rapid adjustment of the ink fountain roller.

In still another form of my invention, I provide means for adjusting the rotational position of the printing plate cylinder with respect to the impression cylinder to correct the web registration between stations, which include a pair of mating helical gears, one of said gears being in direct drive relationship with respect to the printing plate cylinder and the other of said helical gears being in direct drive relationship with respect to the impression cylinder. Means are incorporated for adjusting the relative position between the pair of helical gears to provide partial rotational movement of the printing plate cylinder with respect to the impression cylinder.

There has been outlined rather broadly the more important features of the invention in order that the detailed description thereof that follows may be better understood, and in order that the present contribution to the prior art may be better appreciated. There are, of course, additional features of the invention that will be described hereinafter which will form the subject of the claims appended hereto. Those skilled in the art will appreciate that the conception on which this disclosure is based may readily be utilized as the basis for the design of other structures for carrying out the several purposes of the invention. It is important, therefore, that this disclosure be regarded as including such equivalent constructions as do not depart from the spirit and scope of the invention.

One embodiment of the invention has been chosen for purposes of illustration and description, and is shown in the accompanying drawings, forming a part of this specification, wherein:

FIG. 1 is a detailed side elevation, partly in section, of a flexographic press constructed according to the concept of my invention;

FIG. 2 is an enlarged perspective view showing the gear means for effecting registration of the web between successive printing stations in the press;

FIG. 3 is an enlarged side elevation, taken along the line indicated at 3—3 in FIG. 2;

FIG. 4 is a perspective view of the flexographic press showing the means for effecting movement of the printing plate cylinder with respect to the impression cylinder and movement of the ink fountain roller with respect to the printing plate cylinder;

FIG. 5 is an enlarged vertical sectional view taken along the line indicated at 5—5 in FIG. 4, and showing details of the means for moving the printing plate cylinder with respect to the impression cylinder;

FIG. 6 is an enlarged vertical section view taken along the line indicated at 6—6 in FIG. 4, and showing details of the means for moving the ink plate roller with respect to the printing plate cylinder; and

FIG. 7 is a vertical sectional view taken along the line indicated at 7—7 in FIG. 6.

Referring to the drawings in greater detail, as shown in FIG. 1, a four-color flexographic press embodies a main frame F carrying a supply roll R rotatably mounted on a shaft 12. It will be understood that supply roll R can also be rotatably mounted on a separate unwinding stand with equal facility. Web material is fed from the supply roll around the idler roll 14 and then around draw roll 16, preferably fabricated from rubber or other similar material. From the draw roll 16, the web passes an upper impression cylinder 18 and a first printing plate cylinder 20 at a first printing station, indicated generally at I. Next, the web is fed between a lower impression cylinder 22 and a second printing plate cylinder 24 at a second printing station indicated generally at II, and then the web is fed over a bottom roller 26. Thereafter, the web passes between the lower impression cylinder 22 and a third plate printing plate cylinder 28 at a third printing station indicated generally at III, and then the web passes between the upper impression cylinder 18 and a fourth printing plate cylinder 30 at a fourth printing station indicated generally at IV. Thence, the web is led around idler roller 32 and through a heated drying tunnel to a rewind roll (not shown). In normal operation, the web passes successively through the printing stations I, II, III and IV, and at each printing station a separate color is imprinted thereon by printing plate cylinders 20, 24, 28 and 30, respectively. Frequently, heating means (not shown) are interposed between successively printing stations to hasten the drying and setting of the ink. The web W is drawn from the roll R by the coaction of the impression cylinder 18 and the draw roll 16 which are driven by any suitable source, known in the art. In addition, suitable draw rollers (not shown) on the rewind side of the press may assist in pulling web W through the press.

As best seen in FIGS. 1 and 4, the printing cylinder 20 is mounted on a printing plate cylinder shaft 34 which is supported at each end by upward extensions 36 of printing plate cylinder frame 38. This frame, in turn, is slidably mounted in suitable keyways 40 formed in crossarms 42 of the press frame F. An engraved ink roller 44 associated with the printing plate cylinder 20 is mounted on an ink roller shaft 46 which is carried at each end by an ink system carriage 48. An ink fountain roller 50, mounted on ink fountain roller shaft 52 is also carried at each end by the ink carriage 48. The carriage 48 is slidably mounted in a suitable keyway 54 formed in the printing cylinder frame 38.

On each side of the press, the plate cylinder frame 38 is arranged for controlled travel along the crossarm 42 by a coarse adjusting means and by a fine or vernier adjusting means. Referring in particular to FIG. 4, the fine or vernier adjusting means for the plate cylinder frame comprises a frame adjusting shaft 62 mounted in a bore 64 in the plate cylinder frame 38 for longitudinal motion. This shaft may be locked in any desired longitudinal position by means of a releasable locking screw 66, the locking screw being provided with a handle 68 to simplify its manual manipulation. The other end of the shaft 62 is threaded, as at 70, and a hand manipulatable frame adjusting nut 72 is mounted thereon. This nut is provided with a circumferential groove 74 for receiving a bracket 76 fixedly mounted on the crossarm 42, so that rotation of the nut 72 causes the shaft 62 to move longitudinally with respect to the crossarm 42, thereby causing the plate cylinder frame 38 to move longitudinally with respect to the crossarm 42, providing a fine or vernier adjustment of the plate cylinder frame.

As best seen in FIG. 5, the coarse adjusting means for the travel of the cylinder frame 38 along the crossarm 42 comprises a gear shaft 55 mounted on the crossarm 42, as at 53. A knob 56 is mounted on one end of the gear shaft for purposes of manual manipulation by the operator, and a pair of gears 58, one on each side of the machine, is mounted on the shaft. An elongated rack 60 is mounted on the crossarm 42 on each side of the machine, and the gear shaft is arranged for transverse motion with respect to the press so that when the shaft is moved to the right as viewed in FIG. 5, the gears 58 are in their disengaged positions with respect to racks 60 and when the shaft is moved to the left as viewed in FIG. 5, the gears 58 engage the racks 60. It will be appreciated that when the gear 58 are in their engaged positions, and the releasable lock screws 66 (FIG. 4) are in their released positions, manipulation of the knob 56 in one direction will cause forward motion of the plate cylinder frame 38 with respect to the crossarm 42 and manipulation of the knob in the opposite direction will cause backward motion of the plate cylinder frame with respect to the crossarm. Normally, in operation, after the coarse adjustment has been completed, the lock screws 66 are moved to their locked positions; and then the nuts 72 of the vernier adjusting means are manipulated to complete the fine adjustment of the plate cylinder frame with respect to the crossarm.

On each side of the press, the ink fountain carriage 48 is arranged for controlled travel along the printing cylinder frame 38 by a coarse adjusting means and by a fine or vernier adjusting means. As best seen in FIG. 4, the fine or vernier adjusting means for the ink fountain carriage 48 comprises a carriage adjusting shaft 78 mounted in a bore 80 in the ink fountain carriage for longitudinal motion. This shaft may be locked in any desirable longitudinal position by means of a releasable locking screw 82, the locking screw 82 being provided with a handle 84 to simplify its manual manipulation. The other end of the carriage adjusting shaft 78 is threaded, as at 86, and a hand manipulatable carriage adjusting nut 88 is mounted thereon. This nut is provided with a circumferential groove 90 for receiving a bracket 92 fixedly mounted on the printing cylinder frame 38 so that rotation of the carriage adjusting nut 88 causes the shaft 78 to move longitudinally with respect to the printing cylinder frame 38, thereby causing the ink fountain carriage 48 to move longitudinally with respect to the printing cylinder frame 38, providing a fine or vernier adjustment of the ink fountain carriage.

As best seen in FIGS. 4 and 5, the coarse adjusting means comprises a pair of gears 94, one on each side of the machine, mounted on the gear shaft 55. An elongated rack 96 is mounted on the ink carriage 48 on each side of the machine and the shaft 55 is arranged for transverse motion with respect to the press so that when the shaft is moved to the left, as viewed in FIG. 5, the gears 94 are in their disengaged positions with respect to the racks 96, and when the shaft is moved to the right as viewed in FIG. 5, the gears 94 engage the racks 96. It will be appreciated that when the gears 94 are in their engaged positions, and the releasable lock screws 82 are in their released positions, manipulation of the knob 88 in one direction will cause forward motion of the ink fountain carriage 48 with respect to the plate cylinder frame 38 and manipulation of the knob in the other direction will cause backward motion of the carriage 48 with respect to the frame 38. Normally, in operation, after the coarse adjustment has been completed, the lock screws 82 are moved to their locked positions, and then the nuts 88 of the vernier adjusting means are manipulated to complete the final adjustment of the ink fountain carriage 48 with respect to the plate cylinder frame 38.

As the web W travels between printing stations I, II, III and IV, the speed thereof may vary slightly or the components may not be exactly lined up, thereby resulting in successive printing images of the web that do not register one with the others. Means are provided for correcting the web registration between stations which are incorporated with the main driving mechanism of the press. As best seen in FIGS. 1, 2 and 3, power is supplied to the press from any suitable source through a main shaft 98 mounted for rotation on the frame F. This shaft carries the impression cylinder 18. Also, mounted on the shaft 98 is a helical gear 100. In addition, mounted for rotation on the frame F is a pair of shafts 102, 104 which also carry helical gears 106 and 108, respectively. Both of these gears are mounted and arranged in mating relationship with gear 100. In addition, mounted on shafts 102 and 104 are gears 110 and 112, respectively. Gear 110 drives a gear 114 which is mounted for rotation on shaft 116 carried by bracket 118 mounted on the frame F. A gear 120 driven by gear 114 is mounted on the shaft 34 which also carriage the printing plate cylinder 20. On the other side of the machine, in printing station I, the gear 112 drives gear 122 which is mounted on shaft 124 carried by bracket 126 mounted on the frame F. A gear 128 which is mounted on the shaft 130, carries the printing plate cylinder 30. Accordingly, in operation, rotation of the main drive shaft 98 causes rotation of the impression cylinder 18 as well as of the printing plate cylinders 20 and 30. Shafts 102 and 104 have hand knob 132 and 134, respectively, fixedly attached thereto. It will be understood that manual rotation of knob 132 will cause longitudinal motion of shaft 102 which, in turn, causes rotation of gear 110 relative to gear 100 due to the helical design of gear 106. In this manner, the impression cylinder 118 will remain rotationally fixed while the printing plate cylinder 20 rotates slightly, thereby correcting any registration misalignment. In like manner, manual manipulation of knob 134 serves to cause slight rotation of gear 112 and hence printing plate cylinder 30 with respect to gear 100 and impression cylinder 18.

It will be appreciated that the printing plate cylinders 24 and 28 are arranged and driven with respect to the impression cylinder 22 to provide for the same registration adjustment just described in connection with the printing plate cylinders 20 and 30 with respect to the impression cylinder 18.

It will thus be seen that the present invention does indeed provide a new and improved flexographic press which is superior in simplicity, economy, and efficiency as compared to prior art such devices.

Although a particular embodiment of the invention is herein disclosed for purposes of explanation, various modifications thereof, after study of this specification, will be apparent to those skilled in the art to which the invention pertains.

What is claimed and desired to be secured by Letters Patent is:

1. In a flexographic press having a plurality of printing stations with each station having an ink fountain roller, a printing plate cylinder and a related impression cylinder, the combination in each station comprising means mounting said printing plate cylinders including a printing plate cylinder shaft, said printing plate cylinder being mounted on said printing plate cylinder shaft, a printing plate cylinder frame having upward extensions, said printing plate cylinder shaft being mounted on said extensions, a press frame having a crossarm, said crossarm having a printing plate cylinder frame keyway, said printing plate cylinder frame being slidably mounted on said cylinder frame keyway, a gear shaft, means for manually rotating said gear shaft, a gear mounted on said gear shaft, an elongated rack mounted on said crossarm, said gear shaft being arranged for transverse motion with respect to said press to engage and disengage said gear with respect to said rack, said gear shaft, gear, and rack being arranged to position plate cylinder frame with respect to said crossarm when said gear is in engagement with said rack and said gear shaft is manipulated, a frame adjusting shaft, said plate cylinder frame having a bore for receiving said frame adjusting shaft in sliding motion, a releasable locking screw for locking said frame adjusting shaft in said bore in a preselected position, the other end of said frame adjusting shaft having a threaded portion, a manipulatable frame adjusting nut mounted on said threaded portion, said frame adjusting nut having a circumferential groove, a bracket fixedly mounted on the crossarm and receivable in said circumferential groove to prevent longitudinal movement of said frame adjusting nut by allowing rotational movement, said frame adjusting nut and said frame adjusting screw being arranged to move said plate cylinder frame with respect to said crossarm when said locking screw is in its locked position and said frame adjusting nut is rotated.

2. In a flexographic press having a plurality of printing stations with each station having an ink fountain roller, a printing plate cylinder and a related impression cylinder, the combination in each station comprising means mounting each of said printing plate cylinders for individual movement back and forth relative to its impression cylinder, means mounting each of said ink fountain rollers for individual movement back and forth relative to its printing plate cylinder, said means mounting in said printing plate cylinder including coarse adjusting means and vernier adjusting means, said means mounting said printing plate cylinder including a printing plate cylinder shaft, said printing plate cylinder being mounted on said printing plate cylinder shaft, a printing plate cylinder frame having upward extensions, said printing plate cylinder shaft being mounted on said extensions, a press frame having a crossarm, said crossarm having a printing plate cylinder frame keyway, said printing plate cylinder frame being slidably mounted on said cylinder frame keyway, said coarse adjusting means for adjusting the position of said plate cylinder with respect to said impression cylinder comprising a gear shaft, means for rotating said gear shaft, a gear mounted on said gear shaft, an elongated rack mounted on said crossarm, said gear shaft being arranged for transverse motion with respect to said rack, said gear shaft, gear, and rack being arranged to position said plate cylinder frame with respect to said crossarm when said gear is in engagement with said rack and said gear shaft is manipulated.

3. A flexographic press according to claim 2 wherein said vernier adjusting means for adjusting said plate cylinder with respect to said impression cylinder comprises a frame adjusting shaft, said plate cylinder frame having a bore for receiving said frame adjusting shaft in sliding motion, a releasable locking screw for locking said frame adjusting shaft in said bore in a preselected position, the other end of said frame adjusting shaft having a threaded portion, a manipulatable frame adjusting nut mounted on said threaded portion, said frame adjusting nut having a circumferential groove, a bracket fixedly mounted on said crossarm and receivable in said circumferential groove to prevent longitudinal movement of said frame adjusting nut but allowing rotational movement, said frame adjusting nut and said frame adjusting screw being arranged to move said plate cylinder frame with respect to said crossarm when said locking screw is in its locked position and said frame adjusting nut is rotated.

4. A flexographic press according to claim 2 including means for adjusting the rotational position of the printing plate cylinder with respect to the impression cylinder to correct the web registration between stations comprising a pair of mating helical gears, means mounting one of said gears in direct drive relationship with respect to said printing plate cylinder and means mounting the other of said gears in direct drive relationship with respect to said impression cylinder, means for adjusting the relative position between said pair of helical gears to provide partial rotational movement of said printing plate cylinder with respect to said impression cylinder.

5. In a flexographic press having a plurality of printing stations with each station having an ink fountain roller, a printing plate cylinder and a related impression cylinder, the combination in each station comprising means mounting each of said printing plate cylinders for individual movement back and forth relative to its impression cylinder, means mounting each of said ink fountain rollers for individual movement back and forth relative to its printing plate cylinder, said means mounting said ink fountain roller including coarse adjusting means and vernier adjusting means, means mounting said ink fountain roller including an ink fountain roller shaft, said ink fountain roller being mounted on said ink fountain roller shaft, an ink fountain carriage, said ink fountain roller shaft being mounted on said ink fountain carriage, a printing cylinder frame for carrying said printing plate cylinder and having a keyway for slidably receiving said carriage, means for adjusting the position of said ink fountain roller with respect to said printing plate cylinder comprising a gear shaft mounted on said printing plate cylinder frame, means for rotating said gear shaft, a gear mounted on said gear shaft, an elongated rack mounted on said ink fountain carriage, said gear shaft being arranged for transverse motion with respect to said rack, said gear shaft, gear and rack being arranged to position said ink fountain carriage with respect to said printing plate cylinder frame when said gear is in engagement with said rack and said gear shaft is manipulated.

6. A flexographic press according to claim 5 wherein said vernier adjusting means for adjusting said ink fountain roller with respect to said plate cylinder comprises a carriage adjusting shaft, said ink fountain carriage having a bore for receiving said carriage adjusting shaft in sliding motion, a releasable locking screw for locking in said carriage adjusting shaft in said bore in a preselected position, the other end of said carriage adjusting shaft having a threaded portion, said carriage adjusting nut having a circumferential groove, a bracket fixedly mounted on the plate cylinder frame and receivable in said circumferential groove to prevent longitudinal movement of said carriage adjusting nut but allowing rotational movement, said carriage adjusting nut and said carriage adjusting screw being arranged to move said ink fountain carriage with respect to said plate cylinder frame when said locking screw is in its locked position and said carriage adjusting nut is rotated.

7. A flexographic press according to claim 5 including means for adjusting the rotational position of said printing plate cylinder with respect to said impression cylinder to correct the web registration between stations comprising a main shaft mounted for rotation on a frame of said press, said impression cylinder being mounted on said main shaft, a first helical gear mounted on said main shaft, a second shaft mounted on said frame, a second helical gear mounted on said second shaft, a spur gear mounted on said second shaft, a printing plate cylinder shaft carrying said printing plate cylinder, a spur gear mounted on said printing plate cylinder shaft, gear means interconnecting said spur gear on said second shaft with the spur gear mounted on said printing plate cylinder shaft in driving relationship, said helical gears being constructed and arranged with respect to each other to cause

rotational movement of the printing plate cylinder with respect to the impression cylinder responsive to rotational and axial manipulation of the second shaft.

8. In a flexographic press having a plurality of printing stations with each station having an ink fountain roller, a printing plate cylinder and a related impression cylinder, the combination in each station comprising an ink fountain roller shaft, said ink fountain roller being mounted on said ink fountain roller shaft, an ink fountain carriage, said ink fountain roller shaft being mounted on said ink fountain carriage, a printing cylinder frame for carrying said printing plate cylinder and having a keyway for slidably receiving said carriage, a gear shaft rotatably carried by said printing plate cylinder frame, a gear mounted on said gear shaft, an elongated rack mounted on said ink fountain carriage, means movably mounting said gear shaft on said printing plate cylinder frame for selective relative movement of said gear into and out of operative engagement with said rack means and for manipulating said gear shaft when said gear is in operative engagement with said rack to selectively position said ink fountain carriage with respect to said printing plate cylinder frame.

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United States Patent [19]

Abendroth et al.

[11] **3,749,011**

[45] **July 31, 1973**

[54] **DAMPING DEVICE FOR LITHOGRAPHIC PRINTING PRESSES**

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[73] Assignee: **Roland Offsetmaschinenfabrik Faber & Schleicher AG**, Offenbach, Germany

[22] Filed: **Feb. 26, 1971**

[21] Appl. No.: **119,114**

[30] **Foreign Application Priority Data**

Mar. 5, 1970 Germany ..... P 20 10 387.1

[52] **U.S. Cl.** **101/148**, 101/247

[51] **Int. Cl.** **B41l 25/16**

[58] **Field of Search** 101/137, 140, 144, 101/145, 147, 148, 184, 185, 192, 209, 351, 352, 247

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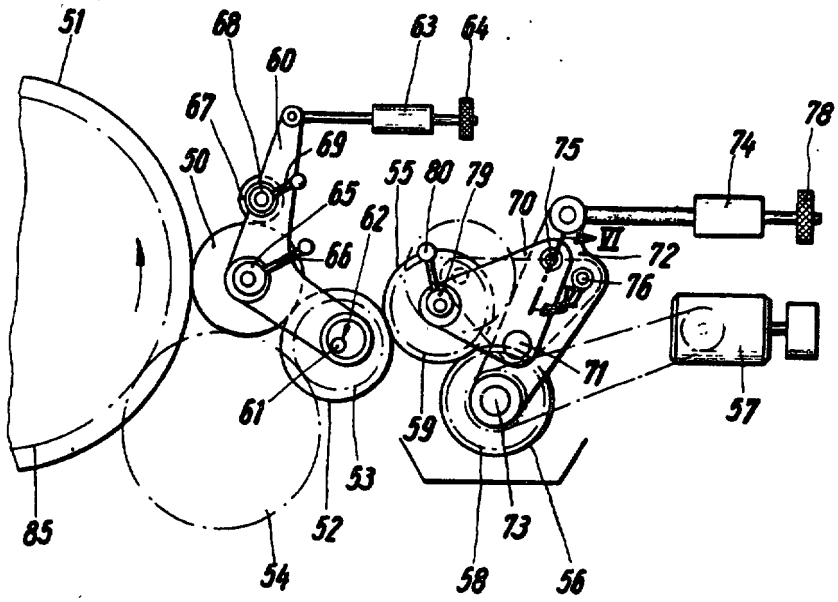
[57] **ABSTRACT**

A damping device for lithographic printing presses comprises a train of four rollers formed by a damping roller to engage the press plate cylinder and a distributing roller which in turn engages an intermediate roller in rolling contact with a fountain roller dipping in a damping solution container. The distributing roller and the fountain roller are both mounted on fixed axes, the other two rollers in the train having their axes on pivoted levers so that they can be brought into and out of engagement with each of the two rollers they respectively engage during operation of the press. The intermediate and damping roller mountings also include provision for adjustment of the inter-axial distance of the rollers. Movement of the rollers between engaged and disengaged positions may be manual or automatic.

8 Claims, 8 Drawing Figures



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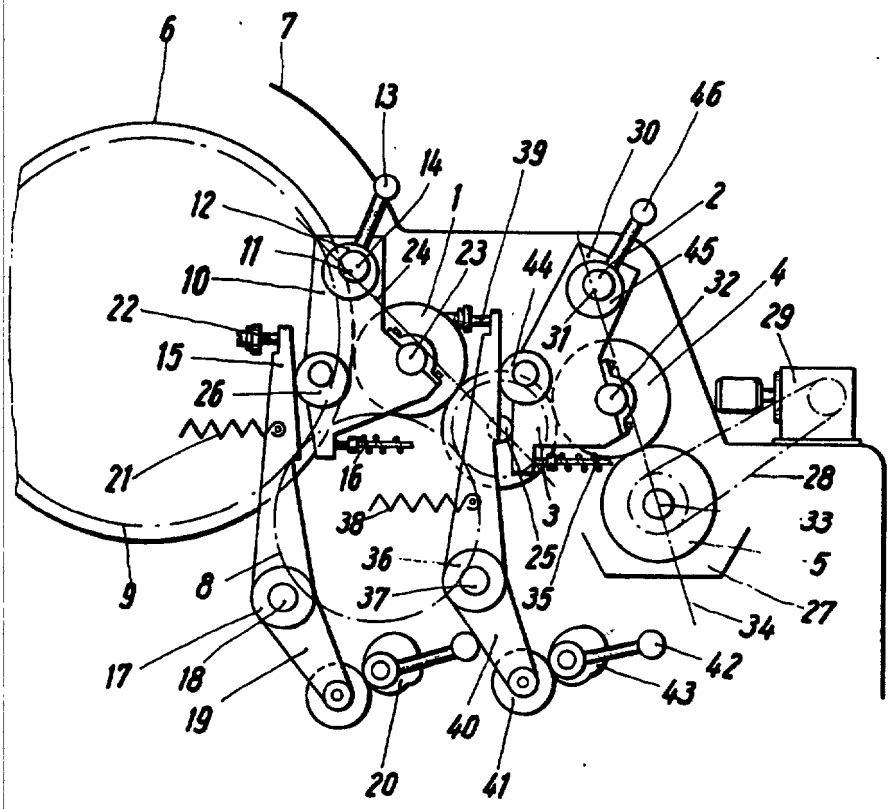

Fig.1

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PATENTED JUL 31 1973

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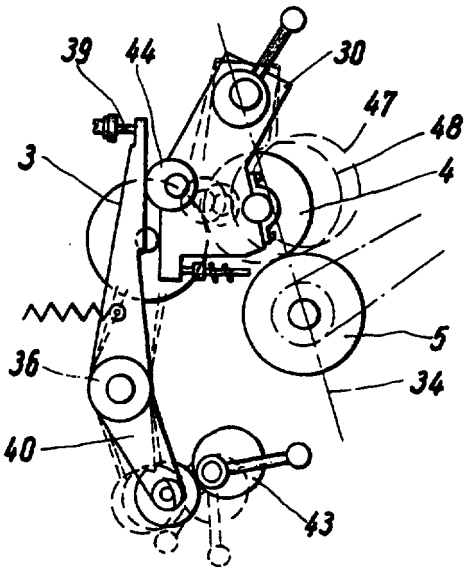

Fig.2

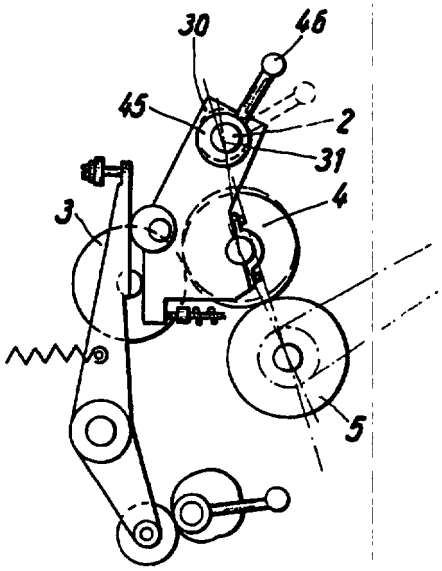

Fig.3

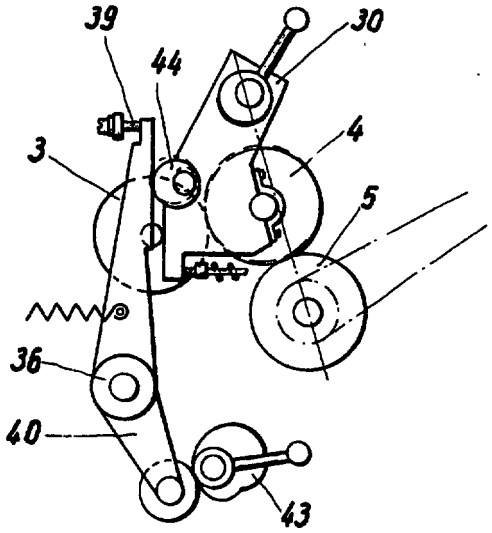

Fig.4

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PATENTED JUL 31 1973

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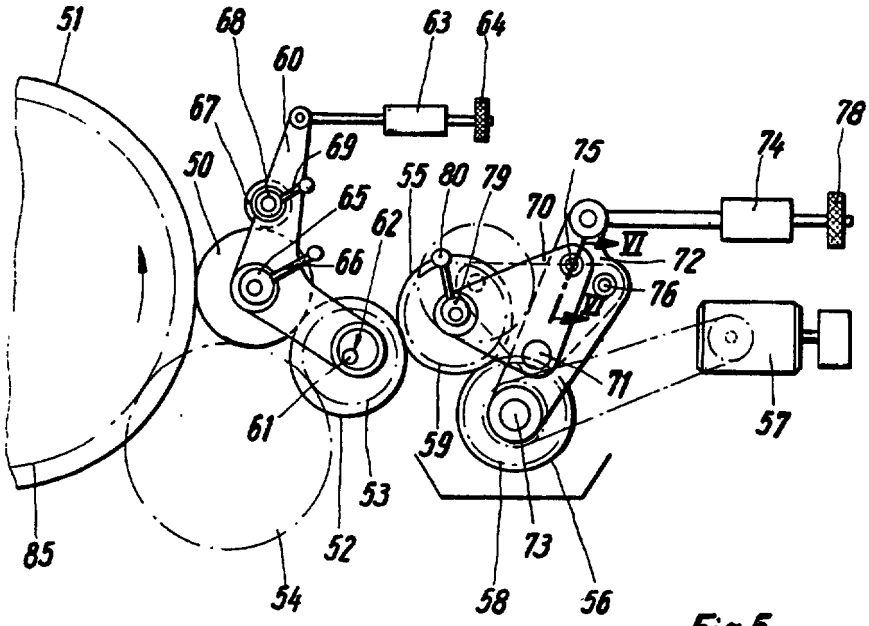

Fig.5

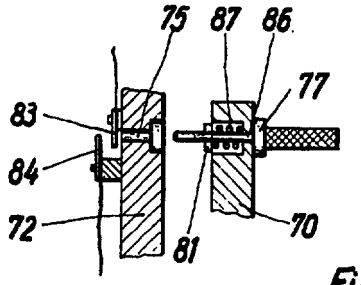

Fig.6

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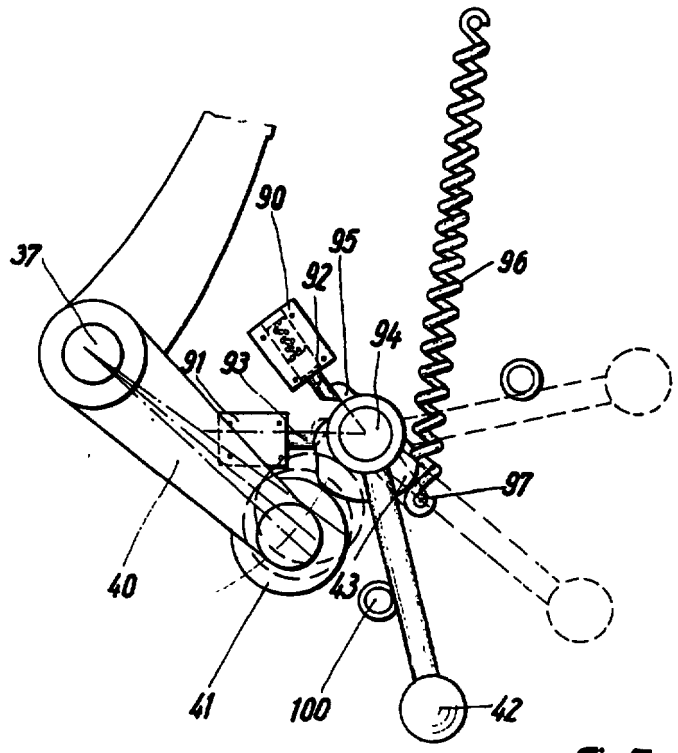

Fig.7

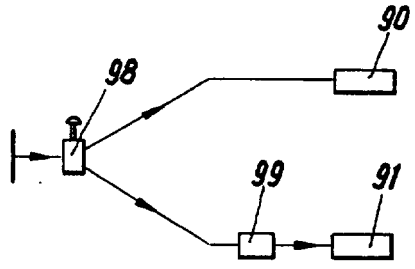

Fig.8

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DAMPING DEVICE FOR LITHOGRAPHIC PRINTING PRESSES

The invention relates to a damping device for lithographic printing presses having at least one distributing roller which runs on the plate cylinder and which is continuously supplied with damping solution by a fountain roller dipping into a damping-solution container and in turn followed by an intermediate roller and a distributing roller, the series-connected rollers being in uninterrupted contact during operation, and the supply of moisture being adjustable by varying the peripheral speed of the fountain roller.

Continuous working damping devices are not always accepted without reserve in practice although the advantages proved in principle are generally recognised. In fact, continuously working damping devices are more sensitive than those working conventionally.

In order to overcome this disadvantage, the rollers of known damping devices are mounted for adjustment in order to be able to set the mutual contact pressures finely. In a damping device according to United States Patent Specification No. 3,283,707, a damping roller, fountain roller and squeeze roller are all mounted for adjustment. The bearing arrangements in each case cannot, however, fulfil the tasks laid down in the invention.

Furthermore, a continuous working damping device is disclosed in United States Patent Specification No. 3,433,155, wherein four rollers are mounted one behind the other. In this damping device, the three rollers preceding the damping roller are displaceable horizontally, together with the drive motor for the variable drive of the fountain roller. In addition, provision is made for the fountain roller to be mounted adjustably in relation to the roller following it and this following roller in turn in relation to the distributing roller mounted next. The means described cannot, however, overcome the disadvantages occurring in continuous working damping devices. In addition, the design is complicated because the fountain-roller drive must likewise be adjustable in position.

It is the object of the present invention to overcome the disadvantages in previously known, continuous working damping devices. At the same time, the device is simpler in design and more reliable in operation. The invention is based on the idea that, in contrast to the fabric-covered, moisture-storing rollers of so-called lifter damping devices, the uncovered rollers of continuous working damping devices obviously have to be machined and adjusted in relation to one another much more accurately. Minor deviations in the roller radius, a slight radial out-of-true or deviations from the axis parallelism obviously have a greater effect. In the design of such damping devices, however, attention has not hitherto been paid to the fact that even manufacture within the closest tolerance ranges is not sufficient if care is not taken to ensure that the rollers retain their external shape during operation. Since relatively hard metal rollers generally co-operate with relatively soft rubber or plastics rollers, there is the risk of the rubber rollers being permanently deformed, particularly, of course, if the machine is at standstill for a long time. The difficulties with plastics rollers are already known, the running and transfer characteristics of which are altered in an unforeseeable manner by ageing. These difficulties are correspondingly increased by unilateral

mechanical stressing. A design must therefore be found wherein the rollers, which are in contact in operation, can be slightly separated from one another when the machine is at a stand-still, and wherein the positively driven rollers are mounted in stationary supports. Furthermore, for reliable operation, care must be taken to ensure that, when the rollers are reengaged, only a roller which has already been moistened ever comes into contact with a roller which is still dry.

In the present invention the intermediate roller can be engaged, disengaged and adjusted in relation to both the fountain roller and also the distributing roller. By this relatively simple means, the fountain roller, the intermediate roller and the distributing roller can be completely separated from one another, and the distributing roller and the fountain roller can be mounted on stationary supports for the easier introduction of a driving torque. Thus it is possible to drive the fountain roller by means of a toothed belt which makes little noise, is free of servicing, has little stretch and in addition is inexpensive.

One embodiment of the invention provides for the damping roller to be able to be engaged, disengaged and adjusted in relation to both the plate cylinder and also of the distributing roller. Thus all the rollers mounted in the damping device can be separated from one another.

In one form of the invention, a device is provided for the gradual engagement of the intermediate roller first with the fountain roller and then with the distributing roller. Thus the operational reliability of the damping device is considerably improved because contact between two drive rollers and hence wear or even "seizing" of rollers is avoided. The gradual engagement may be effected by a construction in which the intermediate roller is mounted in a pivotable lever, the pivotal axis of which is so arranged that a partial pivoting of the lever brings the intermediate roller into contact with the fountain roller wetted with moisture and only further pivoting of the lever engages the now moistened intermediate roller with the distributing roller. It is often sufficient for the sequence of roller engagement to be prescribed while the timing of the sequence is left to the printer. In this case, a stepped cam lever is sufficient for the pivoting of the bearing lever. The position of the cam lever indicates to the printer whether the intermediate roller is engaged and if so where.

Structures in accordance with the invention may include a timing element which determines the difference in time between the intermediate roller being engaged first with the fountain roller and then with the distributing roller. Thus the prerequisites are provided for an automatic course of the engagement operation.

In a further embodiment of the invention, the intermediate roller is mounted in a first lever which is mounted for pivoting on a second lever, this second lever being mounted for pivoting about the axis of rotation of the fountain roller. With this arrangement, "switching through" as with a stepped cam is impossible, because the engagement with the particular roller is effected by pivoting a separate lever in each case. In addition, engagement, disengagement or positional adjustment of the intermediate roller in relation to the distributing roller is possible by pivoting the second lever about the axis of rotation of the fountain roller without the fine adjustment of the intermediate roller in relation to the fountain roller being altered.

In a further embodiment of the invention, two detents are provided which co-operate with the first lever and by means of which the engaged and disengaged position of the intermediate roller is determined in relation to the fountain roller, the fine adjustment between intermediate roller and fountain roller being effected by adjusting eccentric bearing bushes in which the intermediate roller is mounted. When eccentric bearing bushes are used, advantageous transmission ratios may be used for fine adjustment while the engagement and disengagement of the intermediate roller is effected by pivoting a lever between two end positions. By transferring the fine adjustment and the engagement and disengagement to members adapted to be actuated independently of one another, a particularly favourable design is possible for the particular purpose to be fulfilled.

In a development of the invention, a lock is provided which permits actuation of the second lever only when the first lever is in that stop position which corresponds to the engaged position of the intermediate roller in relation to the fountain roller. This ensures that the intermediate roller can only be engaged with the distributing roller when it is also engaged with the fountain roller. The fine adjustment of the intermediate roller in relation to the distributing roller can, however, be effected at any time independently thereof. The lock may be electrical in the form of a microswitch, the actuation of which is a prerequisite for a working cylinder or magnet becoming active, but it may also be mechanical in the form of a locking pawl.

The damping roller is preferably driven positively at the peripheral speed of the plate cylinder and a further distributing roller is provided which can be driven by friction over its circumference is engageable with and disengageable from the damping roller. It is particularly favourable to mount the distributing roller at a point situated after contact with the plate cylinder seen in the direction of rotation of the roller. A distributing roller brought into contact with the damping roller after contact with the printing plate has a satisfactory cleaning effect and its arrangement is necessary particularly with non-absorbent rubber damping rollers. Here, too, however, care must be taken to ensure that the distributing roller does not make any indentations on the damping roller and that it is separated from the damping roller at least during prolonged periods of standstill.

Embodiments of the invention by way of example are illustrated diagrammatically in the accompanying drawings in which:

FIG. 1 shows a side view of a damping device according to the invention;

FIG. 2 shows the diagrammatic illustration of the engagement or disengagement of an intermediate roller in stages in relation to a stationarily mounted fountain roller as shown in FIG. 1;

FIG. 3 shows the diagrammatic illustration of the fine adjustment of the intermediate roller in relation to the fountain roller as shown in FIG. 1;

FIG. 4 shows the diagrammatic illustration of the fine adjustment of the intermediate roller in relation to a distributing roller as shown in FIG. 1;

FIG. 5 shows the side view of a further embodiment of a damping device according to the invention;

FIG. 6 shows a detail on section line VI—VI in FIG. 5;

FIG. 7 shows a device for the automatic engagement of the intermediate roller in stages; and

FIG. 8 shows a flow chart of the automatic system shown in FIG. 7.

The damping device shown in FIG. 1 consists of a damping roller 1, a distributing roller 3, and intermediate roller 4 and a fountain roller 5. The damping roller 1 is in contact with the plate cylinder 6 of a printing press 7 indicated in outline, and the distributing roller 3. It is driven over tis circumference by frictional contact with the distributing roller 3 and the plate cylinder 6. The distributing roller 3 is positively driven, through an intermediate gearwheel 8, by a gearwheel 9 secured to the plate cylinder 6. The damping roller 1 is mounted in bearing levers 10 which are mounted for pivoting about the axis of rotation 11 of adjustable bushes 12 which are drilled eccentrically. The eccentric bushes 12 are mounted on pins 14 secured to the side walls of the machine and are turned by means of hand levers 13. Since both ends of the individual rollers are mounted in the same manner, the description is restricted to one side of the damping device. The pivoting of the bearing lever 10 and hence the adjustment of the damping roller 1 in relation to the plate cylinder 6 is limited by a stop 15 which is urged against the bearing lever 10 by a compression spring 16. The stop 15 is constructed in the form of a two-armed lever 17 which is mounted for rotation about a pin 18. One arm of the lever 17 represents the stop for the bearing lever 10 while the other arm is a roller lever 19 which is in contact with a two-step cam 20. The two-armed lever 17 is urged, by spring force 21, against an adjustable stop 22 and can be turned in clockwise direction by the stepped cam 20, against the spring force 21, for the purpose of disengaging the damping roller 1 from the plate cylinder 6, first stage, and for disengaging the damping roller 1 from the distributing roller 3, second stage. The axis of rotation 23 of the damping roller 1 lies, when the damping roller 1 is engaged with the plate cylinder 6, outside the straight line 24 which intersects the pivotal axis 11 and the axis of rotation 25 of the distributing roller 3 on the side of the line adjacent to the plate cylinder 6, so that disengagement of the damping roller 1 from the distributing roller 3 is only effected after a relatively great angle of pivoting of the bearing lever 10, corresponding to the second step of the stepped cam 20. The fine adjustment of the damping roller 1 in relation to the plate cylinder 6 is effected by turning a cam 26 mounted on the bearing lever 10. The fine adjustment of the damping roller 1 in relation to the distributing roller 3 is effected by turning the eccentric bush 12 by means of the hand lever 13.

The distributing roller 3, which is mounted in stationary supports, is in contact with the intermediate roller 4 to which the damping solution is transferred by contact with the fountain roller 5 dipping into a damping-solution container 27. The fountain roller 5 is likewise mounted stationary and is driven by a variable-speed electric motor 29 through a toothed belt 28. The intermediate roller 4 is mounted for pivoting about an axis 31 in bearing levers 30, in a similar manner to the damping roller 1. The axis of rotation 32 of the intermediate roller 4 engaged with the distributing roller 3 and a fountain roller 5 is likewise outside the straight line 34 intersecting the pivotal axis 31 and the axis of rotation 33 of the fountain roller 5, namely at the side adjacent to the distributing roller 3. The bearing lever 30 is urged, by spring force 35, against a two-armed

stop lever 36. This is mounted for pivoting about a pin 37 and is pulled towards an adjustable stop 39 by a tension spring 38. The other arm of the stop lever 36 is constructed in the form of a roller lever 40, the roller 41 of which is in contact with a two-step cam 43 which can be turned by means of a hand lever 42. It is obvious that a partial pivoting of the bearing lever 30, corresponding to the first step on the cam 43, merely brings the intermediate roller 4 out of contact with the distributing roller 3, and only further pivoting of the bearing lever 30, corresponding to the second step of the cam 43, brings the intermediate roller 4 out of contact with the fountain roller 5. The fine adjustment of the intermediate roller 4 in relation to the distributing roller 3 is effected by turning a cam 44 which is mounted on the bearing lever 30 and which is in contact with the stop lever 36. The fine adjustment of the intermediate roller 4 in relation to the fountain roller 5 is effected by turning a bearing bush 45 which is mounted eccentrically on a pin 2 and on which there is mounted the bearing lever 30, by means of a hand lever 46.

FIG. 2 shows the different positions of the intermediate roller 4 in relation to the distributing roller 3 and the fountain roller 5, which can be reached by pivoting the bearing lever 30 (shown in broken lines). The roller as shown in broken lines 47 is disengaged both from the distributing roller 3 and also from the fountain roller 5. The roller as shown in broken lines 48 is engaged only with the fountain roller 5 and not with the distributing roller 3. FIG. 3 likewise shows, illustrated in broken lines, the fine adjustment of the intermediate roller 4 in relation to the fountain roller 5 by turning the eccentric bush 45. The pivotal axis 31 travels over a circle about the pin 2. FIG. 4 shows, likewise in broken lines, the fine adjustment of the intermediate roller 4 in relation to the distributing roller 3 by turning the cam 44.

A further embodiment of a damping device according to the invention is illustrated in FIG. 5. This damping device likewise contains four rollers mounted one behind the other; a damping roller 50 which is in contact with the plate cylinder 51 and is driven by frictional contact over the circumference of the roller; a distributing roller 52 which is positively driven through gearwheels 53, 54 and 85; an intermediate roller 55 and a fountain roller 56. The fountain roller 56 is driven by an independent, variable-speed electric motor 57. The intermediate roller 55 may appropriately be driven by the fountain roller through a pair of gearwheels 58, 59. The gearwheel ratio may be 1 so that slip occurs between the rollers 52 and 55, but it may also be selected so that slip occurs between the rollers 55 and 56 or between both pairs of rollers 52, 55 and 55, 56. The damping roller 50 is mounted in a lever 60 which is pivotable about an axis 62 situated outside the axis of rotation of the distributing roller 52. The position of the axis 62 is selected so that, on pivoting of the lever 60, as a result of actuation of a pneumatic cylinder 63, the damping roller 50 comes out of contact both with the plate cylinder 51 and also with the distributing roller 52. The fine adjustment of the damping roller 50 in relation to the plate cylinder 51 is effected by adjusting the pneumatic cylinder 63 by means of a micrometer screw 64. The damping roller 50 is mounted in eccentric bushes 65. The fine adjustment of the damping roller 50 in relation to the distributing roller 52 is effected by turning these bushes 65 by means of hand levers 66. Furthermore, a further distributing roller 67 is mounted in the eccentric bushes 68 in the lever 60. By turning the eccentric bushes 68 by means of a hand lever 69, the distributing roller 67 can be engaged with or disengaged from the damping roller 50.

The intermediate roller 55 is mounted in a first lever 70 which is pivotable about a pin 71. The pin 71 is secured in a second lever 72 which is mounted for pivoting about the axis of rotation 73 of the fountain roller 56. The pivoting is effected by actuating a pneumatic cylinder 74. Two bores 75, 76 are provided in the second lever 72 (see also FIG. 6) and co-operate with a pin 77 mounted on the first lever 70 and so determine the two end positions of the pivoting of the lever 70. Thus, as a result of actuating the first lever 70, the intermediate roller 55 is engaged with or disengaged from the fountain roller 56, in the engaged state, independently of its fine adjustment in relation to the rollers 52 and 56. The fine adjustment of the intermediate roller 55 in relation to the distributing roller 52 is effected by adjusting the pneumatic cylinder 74 by means of the micrometer screw 78. The fine adjustment of the intermediate roller 55 in relation to the fountain roller 56 is effected by turning an eccentric bush 79 in which there is mounted the intermediate roller 55. The eccentric bush 79 is turned by means of a hand lever 80 but it may also be turned by means of a toothed-wheel gearing. The pin 77 is displaceable in a bore 86 in the first lever 70 as shown in FIG. 6. The pin 77 is urged into the position shown in FIG. 6 by the force of the compression spring 87 which is wound round the shank of the pin 77 and bears on the one hand against the first lever 70 and on the other hand against a disc 81 secured to the pin. Mounted at the bore 75 of the second lever 72 is a pair of contacts 83, 84 which can be closed by the pin 77. The pneumatic cylinder 74 can only be actuated if the pair of contacts 83, 84 is closed, that is to say if the pin 77 is engaged in the bore 75, that is to say the intermediate roller 55 is engaged with the fountain roller 56.

FIGS. 7 and 8 indicate in diagrammatic form how an engagement operation in steps can be made automatic. Two lifting magnets 90, 91 are provided, of which the armatures constructed in the form of stops 92, 93 project, in the de-energised state, within the pivotal range of a cam 95 which is secured to the shaft 94 and can be turned with this. Likewise secured to this shaft 94 is the two-step cam 43. A tension spring 96 engages on a strap 97 secured to the shaft 94 and causes this to turn in counter clockwise direction. The turning is prevented by a first stop 92 as shown in FIG. 7. On actuation of a circuit element 98 as shown in FIG. 8, the first magnet 90 attracts and permits turning of the shaft 94 until the cam 95 comes into abutment with the second stop 93. At the same time, as shown in FIG. 8, a timing element 99 is controlled which, after an adjustable interval of time, controls the second magnet 91, whereupon a further turning of the shaft 94 is effected until the hand lever 42 comes into abutment against an end stop 100.

What is claimed is:

1. A dampening device for a printing press including a rotary plate cylinder, said device comprising in combination: a train of rolls sequentially including a dampening roll, a distributing roll, a moistening fluid transmitting intermediate roll and a fountain roll, said rolls being movable into and out of fluid transmitting and

driving engagement with each other, said dampening roll being further movable into and out of fluid transmitting engagement with the plate cylinder, the distributing roll and the fountain roll being rotatable about stationary axes and the dampening roll and the intermediate roll being rotatable about pivotally displaceable axes; drive means for positively driving the dampening roll and variable speed drive means for positively driving the fountain roll; first setting means for moving the dampening roll into and out of engagement with the plate cylinder and the distributing roll, said setting means including a pivotal member mounting the dampening roll and actuating means coacting with said pivotal member for successively pivoting the same through a first distance for gradually engaging and reengaging, respectively, the dampening roll and the plate cylinder and subsequently through a second distance for gradually engaging and reengaging, respectively, the dampening roll and the distributing roll also; and second setting means for moving the intermediate roll into and out of engagement with the distributing roll and the fountain roll, said second setting means including a pivotal member mounting the dampening roll and actuating means coacting with said pivotal member for successively pivoting the same through a first distance for gradually engaging and disengaging, respectively, the fountain roll and the intermediate roll and subsequently through a second distance for gradually engaging and disengaging, respectively, the intermediate roll and the distributing roll also.

2. The dampening device according to claim 1 and comprising first fine adjustment means coacting with the pivotal member of the first setting means for selectively varying the engagement pressure between the plate cylinder and the dampening roll when the latter is set for engagement with the plate cylinder, and second fine adjustment means coacting with the pivotal member of the second setting means for selectively varying the engagement pressure between the fountain roll and the intermediate roll when the latter is set for engagement with the fountain roll.

3. The dampening device according to claim 1 and comprising delay means for controlling the time differential between moving the intermediate roll into engagement with the fountain roll and then with the distributing roll, said delay means including a first and a second stop supported by the pivotal member of the second setting means for turning in unison with said member, the first stop controlling turning of the pivotal member into the angular position for moving the intermediate roll into engagement with the fountain roll and the second stop controlling further turning of the pivotal member into the angular position for moving the intermediate roll into engagement with the distributing roll also, first solenoid means coacting with said first stop and second solenoid means coacting with said second stop, circuit means connected in circuit with said solenoid means, and a timing means included in said circuit means, energization of said circuit means activating the first solenoid means for releasing the first stop and also activating the timing means, said timing means activating the second solenoid means for release of the second stop after a predetermined delay time.

4. The dampening device according to claim 1 wherein the pivotal member of the second setting means comprises a first lever mounting the intermediate roll, and a second lever pivotally mounts said first lever, said second lever being pivotal about the rotational axis of the fountain roll.

5. The dampening device according to claim 4 wherein two detents in the second lever are engageable by means on the first lever forming stops whereby the engaged and disengaged position of the intermediate roll is determined in relation to the fountain roll, and wherein a fine adjustment between intermediate roll and fountain roll is effected by adjusting eccentric bearing bushes in which the intermediate roll is mounted.

6. The dampening device according to claim 5 and comprising a lock which permits actuation of the second lever only in the stop position of the first lever which corresponds to the engaged position of the intermediate roll in relation to the fountain roll.

7. The dampening device according to claim 1 wherein the actuating member of each of said setting means comprises a rotatable stepped cam member in engagement with the respective one of said pivotal members, turning means for rotating said cam member step-by-step, turning of the cam member through one step pivoting the respective pivotal member through said first distance and turning of the cam member through a second step pivoting the respective pivotal member through said second distance.

8. The dampening device according to claim 7 wherein each of said pivotal members comprises a two-arm lever, one arm of the levers forming a follower for the respective cam member and the other arm of the levers coacting with the dampening roll and the intermediate roll, respectively, for causing movements thereof into and out of engagement with the respective rolls as aforesaid.

* * * * *

United States Patent [19]

Dahlgren

[11] **3,986,452**

[45] ***Oct. 19, 1976**

[54] **LIQUID APPLICATOR FOR LITHOGRAPHIC SYSTEMS**

[75] Inventor: **Harold P. Dahlgren**, Dallas, Tex.

[73] Assignee: **Dahlgren Manufacturing Company, Inc.**, Dallas, Tex.

[*] Notice: The portion of the term of this patent subsequent to July 5, 1983, has been disclaimed.

[22] Filed: **Aug. 14, 1972**

[21] Appl. No.: **280,357**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 600,650, Dec. 9, 1966, Pat. No. 3,705,451, which is a continuation-in-part of Ser. No. 414,574, Nov. 30, 1964, abandoned, which is a continuation-in-part of Ser. No. 26,035, May 2, 1960, Pat. No. 3,168,037, which is a continuation-in-part of Ser. No. 844,372, Oct. 5, 1959, abandoned.

[52] **U.S. Cl.** **101/148**

[51] **Int. Cl.²** **B41F 7/24**

[58] **Field of Search** 101/148, 147, 349, 350, 101/351, 206-209

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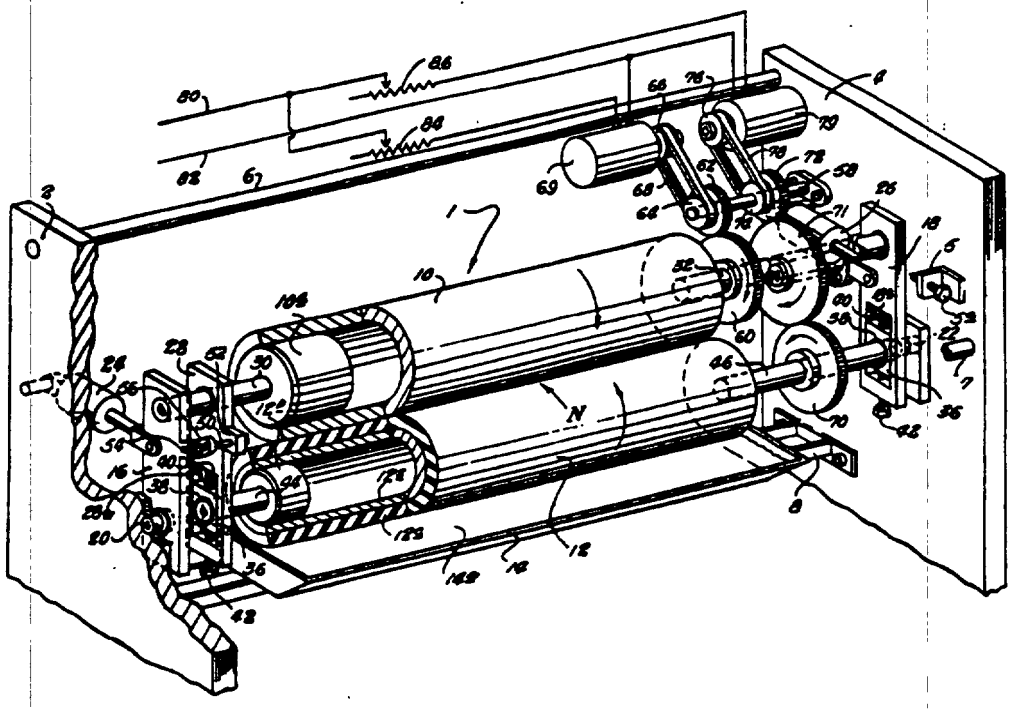
[57] **ABSTRACT**

A method and apparatus for applying a controlled quantity of dampening fluid to a lithographic printing system comprising a smoothly finished hydrophilic transfer roller mounted in pressure indented relation with a metering roller having a smooth resilient surface. Pressure between the metering roller and transfer roller is adjustable and the respective rollers are driven by independent variable speed drive means such that surface speeds of the rollers relative to each other and relative to surfaces of the lithographic printing system are precisely controllable.

3 Claims, 3 Drawing Figures



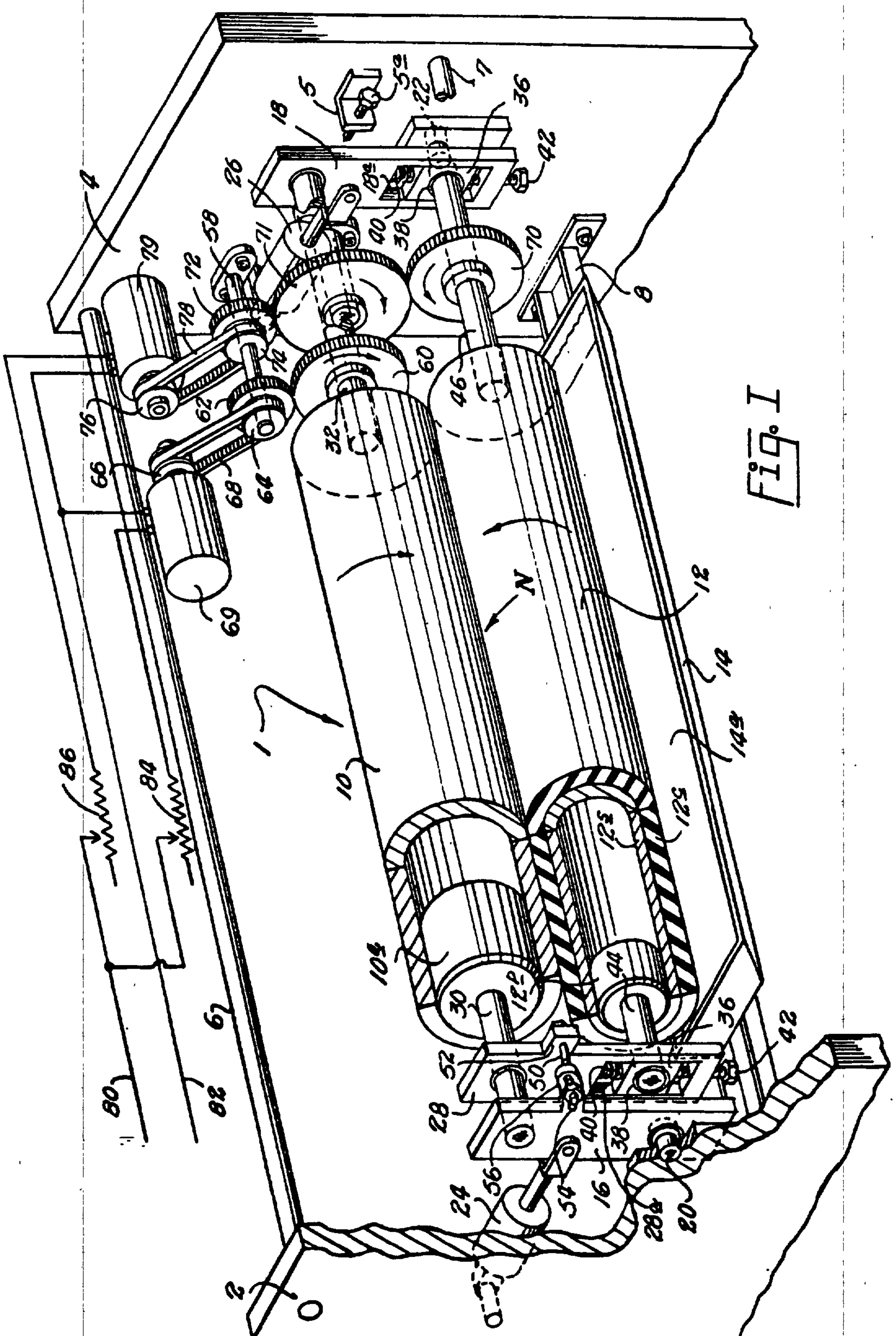


Fig. I

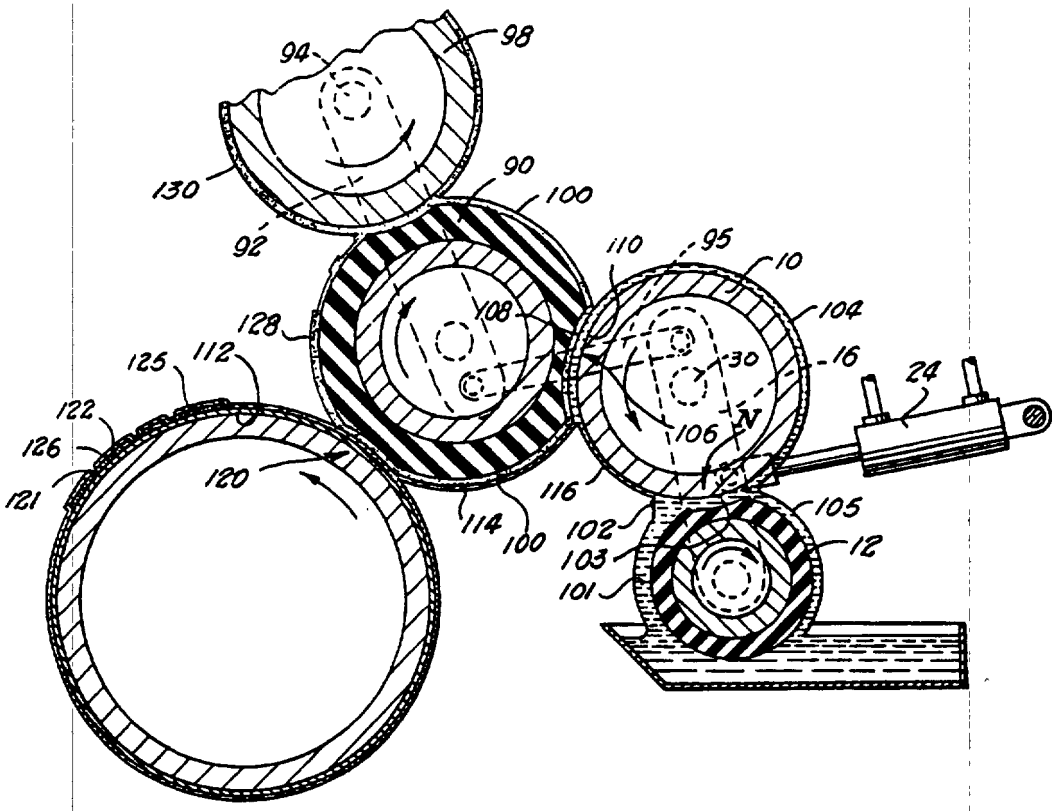


Fig. II

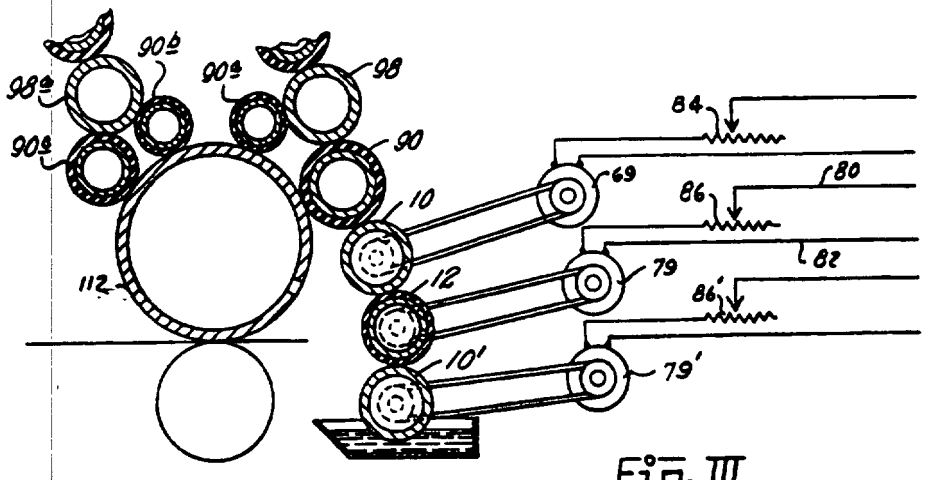


Fig. III

LIQUID APPLICATOR FOR LITHOGRAPHIC SYSTEMS

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a continuation-in-part of U.S. Pat. application Ser. No. 600,650 filed Dec. 9, 1966 entitled "Dampening Transfer and Material Conditioning Roller and Method of Preparing Same", (now U.S. Pat. No. 3,705,451) which was a continuation-in-part of Ser. No. 414,574 filed Nov. 30, 1964 (abandoned) which was a continuation-in-part of Ser. No. 26,035, filed May 2, 1960 (now U.S. Pat. No. 3,168,037) entitled "Means for Dampening Lithographic Offset Printing Plates", which was a continuation-in-part of Ser. No. 844,372 filed Oct. 5, 1959, now abandoned.

BACKGROUND OF INVENTION

Dampening systems of the type disclosedd in U.S. Pat. No. 3,168,037 and U.S. Pat. No. 3,343,484 to Harold P. Dahlgren have offered significant improvements over dampening systems previously employed.

Such systems have included two rollers disposed in pressure indented relation, one of the rollers having a relatively hard hydrophillic surface and the other roller having a smooth resilient surface. In the preferred embodiment illustrated in the drawings of the aforementioned patents the transfer and metering rollers were geared together to travel at substantially equal surface speeds and were driven by a variable speed drive means for metering a film of dampening fluid through a nip between the rollers and for transferring the film of dampening fluid to the lithographic printing system.

The thickness of the film of dampening fluid delivered to the surface of the transfer roller moving out of the nip between the metering roller and transfer roller was controlled primarily by adjustment of pressure between adjacent surfaces of the metering and transfer rollers.

The rate at which the metered film of dampening fluid, carried on the surface of the transfer roller, was delivered to the lithographic printing system was controlled by the variable speed drive means. Briefly stated, the theory of operation was that given a film of predetermined thickness the quantity of dampening fluid delivered was directly related to the speed of the film. In other words, to reduce the rate at which dampening fluid was delivered to the lithographic system, the transfer roller speed could be reduced; and, to increase the quantity of dampening fluid, the speed of the transfer roller could be increased. However, such results follow only so long as the speed differential between the transfer roller and the ink coated form roller was not excessive.

Excessive slippage resulted in application of hydraulic forces in the nip between the transfer roller and the applicator roller which caused excessive emulsification of the distinct films of ink and dampening fluid. Excessive emulsification of ink and dampening fluid at the nip between the transfer roller and form roller resulted in transfer of the emulsion by the surface of the transfer roller to the surface of the resilient metering roller which was not hydrophillic. Build-up of ink on the surface of the metering roller resulted in streaking of printed sheets because of non-uniform surface characteristics of the metering roller which caused a non-uniform film of dampening fluid to be metered onto the surface of the transfer roller.

To accommodate existing press design, metering and transfer rollers have been constructed of diameters generally in a range of approximately 3 to 6 inches. At surface speeds of about 300 feet per minute films of dampening fluid tended to separate from the surface of the metering roller as a result of centrifugal force. When the metering roller, geared to the transfer roller, was slowed to prevent splashing and slinging of dampening fluid, excessive slippage resulted at the nip between the transfer roller and the form roller which carried the dampening fluid to the lithographic printing system.

In applications where the metering roll was driven by the hydrophillic transfer roller and where a relatively fast hydrophillic transfer roller surface speed was required for printing, such as in a web press, the metering roller slung water to such an extend that experiments were conducted on apparatus wherein the transfer roller and metering roller were geared together to run at a speed ratio of 2:1 thereby substantially reducing the surface speed of the metering roller which carried a thick film of dampening fluid. Slinging of dampening fluid was then stopped but the film of dampening fluid delivered by the transfer roller was of a thickness which required excessive slippage, resulting in excessive emulsification, between the hydrophillic transfer roller and the form roller.

Tests were conducted on a printing press having an ink coated form roller running at a surface speed of 1,000 feet per minute. The hydrophillic transfer roller and the resilient metering roller of the liquid applicator system were geared together at a speed ratio of 5:3. The liquid applicator system could not be adjusted to provide acceptable results because as the surface speed of the transfer roller was increased to prevent excessive slippage between adjacent surfaces of the transfer roller and the applicator roller too much water was delivered to the lithographic system. Increasing pressure at the nip between the metering roller and the transfer roller did not effectively reduce the thickness of the film of dampening fluid, carried by the transfer roller, to the required thickness.

A further test was conducted on the same printing press when the surface speed of the form roller was 1,000 feet per minute. However, the hydrophillic transfer roller and the resilient metering roller were driven by separate variable speed drive motors such that the transfer roller was run at a surface speed of 500 feet per minute and the metering roller was run at speeds of less than 50 feet per minute. Extremely high quality printing was produced.

In laboratory experiments the film thickness carried by the surface of the hydrophillic transfer roller was measured. The transfer and metering rollers were geared together at a 1:1 speed ratio and pressure between the rollers was maintained at a constant level. As surface speeds of the transfer and metering rollers were continuously increased the thickness of the film carried on the surface of the transfer roller did not continuously increase. A graph of the film thickness relative to surface speed of the metering and transfer rollers produced a curve of somewhat sinusoidal nature.

The same test was conducted with the transfer and metering rollers being geared together at a speed ratio of 2:1. Again the film thickness was somewhat sinusoidal in nature as surface speeds of the rollers were in-

creased. Thus, transfer and metering rollers geared together at a fixed speed ratio do not deliver a uniformly increasing quantity of dampening fluid to a lithographic printing system as surface speeds of the rollers are increased over a wide range of speeds. As the surface speeds of the rollers is increased the quantity of dampening fluid increases to a point after which further increase in the surface speed of the rollers results in reduction in the quantity of dampening fluid delivered.

From the foregoing it is concluded that provision of separate variable speed drive means for independently controlling surface speeds of metering and transfer rollers of the systems of the type disclosed in the aforementioned Dahlgren patents permits metering of thinner films in precisely controlled quantities onto the surface of the transfer roller and permits adjustment of the surface speed of the transfer roller relative to the surface speed of an applicator roller to produce desired hydraulic forces in the nip between the transfer roller and the applicator roller to prevent excessive emulsification of dampening fluid and ink while delivering proper amounts of dampening fluid to the lithographic printing system.

SUMMARY OF INVENTION

I have developed an improved liquid applicator for lithographic systems comprising a transfer roller having a hard smooth hydrophillic surface disposed in pressure indented relation with a metering roller having a smooth resilient surface wherein the transfer roller and metering roller are independently driven by variable speed drive means permitting independent precision control of surface speeds of each of the rollers.

The metering roller is preferably rotated such that the surface speed thereof will carry an abundant supply of dampening fluid to the nip between the transfer roller and the metering roller. The transfer roller is rotated such that the surface speed thereof is substantially greater than the surface speed of the metering roller for transferring a relatively thin film of dampening fluid to the surface of a form roller of a lithographic system.

The transfer roller preferably rotates such that the surface speed thereof is different from that of the form roller and adjusted such that a portion of the film of dampening fluid on the transfer roller will be applied to the surface of the form roller while sufficient dampening fluid remains upon the surface of the transfer roller moving away from contact with the form roller to maintain a continuous film of dampening fluid thereon for maintaining ink rejecting properties of the hydrophillic surface.

Pressure between the metering roller and the transfer roller is adjustable and pressure along the length thereof is controlled by skewing apparatus adapted to move an end of one of the rollers circumferentially about the axis of the other roller to spirally twist the resilient surface of the resilient roller about the harder surface of the other roller.

A primary object of the invention is to provide a liquid applicator for lithographic systems particularly adapted for continuously supplying a precisely regulated quantity of dampening fluid to a lithographic system at a precisely controlled rate.

Another object of the invention is to provide a liquid applicator for lithographic printing systems adapted to precisely control hydraulic force at a nip between adjacent rollers for splitting a metered film carried by one of the rollers to cause a film to be transferred to the other roller.

Another object is to provide a liquid applicator for lithographic printing systems which is particularly adapted to reduce the tendency of dampening fluid and ink to become emulsified and fed into the dampening fluid metering apparatus.

A further object is to provide a liquid applicator for lithographic printing systems adapted to prevent transfer of ink to a nip between transfer and metering roller positioned in pressure indented relation for metering a film of dampening fluid.

A further object is to provide a liquid applicator adapted to meter a uniform film of dampening fluid onto a lithographic printing plate moving at speeds in excess of 1,000 feet per minute.

Another object of the invention is to provide a liquid applicator for lithographic systems particularly adapted for use on high speed web presses wherein surface speeds of rollers of the apparatus are independently controllable to deliver metered quantities of dampening fluid to a lithographic system wherein rollers of the liquid applicator are not rotated at a speed which would result in centrifugal force, tending to separate the film from the surface, exceeding the force of molecular attraction, tending to resist separation of the film of dampening fluid from the surface of the roller.

Another object of the invention is to provide a liquid applicator system for printing presses wherein a transfer roller and metering roller are mounted for adjustment in longitudinal and axial relationship to provide for exact and desired pressure therebetween along the entire lengths thereof and to provide proper distribution and thickness of dampening fluid throughout the lengths of the rollers.

These and other objects are effected by my invention as will be apparent in the following description taken in conjunction with the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

Drawings of two embodiments of the invention are annexed hereto so that the invention may be better and more fully understood, in which;

FIG. I is a diagrammatic perspective view of the liquid applicator system;

FIG. II is an enlarged diagrammatic view illustrating the relative positions of the source of dampening fluid, a metering roller, a transfer roller and a form roller in a lithographic printing system;

FIG. III is a diagrammatic view similar to FIG. II of a modified form of the liquid applicator system illustrating roller means arranged to meter a film of dampening fluid onto the surface of the metering roller.

Numeral references are employed to designate like parts throughout the various figures of the drawings.

DESCRIPTION OF A PREFERRED EMBODIMENT

In FIG. I of the drawing the numeral 1 generally designates a liquid applicator system adapted for use in conjunction with inker apparatus for applying dampening fluid and ink to a lithographic printing plate of a printing press.

Liquid applicator 1 comprises spaced side frames 2 and 4 joined by tie bars 6, 7 and 8 forming a strong rigid structure for supporting transfer roller 10, metering roller 12 and dampening fluid pan 14.

Throw-off links 16 and 18 are pivotally secured by stub shafts 20 and 22 to the respective side frames 2 and 4. Throw-off cylinders 24 and 26 are pivotally connected between side frames 2 and 4 and throw-off links 16 and 18, respectively, for pivoting throw-off links 16 and 18 about stub shafts 20 and 22 for moving transfer cylinder 10 into position, as will be hereinafter more fully explained, for delivering dampening fluid to a lithographic printing system.

A skew arm 28 is mounted for pivotal movement about the axis of transfer roller 10. As diagrammatically illustrated in FIG. I skew arm 28 is rotatably secured to stub shaft 30 extending outwardly from the end of transfer roller 10.

Skew arm 28 and throw-off link 18 have passages 28*a* and 18*a* respectively, formed in lower ends thereof in which blocks 36 carrying self-aligning bearings 38 are slidably disposed. Suitable means such as resilient springs 40 urge blocks 36 longitudinally of skew arm 28 and throw-off link 18 in a direction away from the longitudinal axis of transfer roller 10. A pressure adjustment screw 42 urges block 36 longitudinally of skew arm 28 and throw-off link 18 against the bias of springs 40. Stub shafts 44 and 46, extending outwardly from opposite ends of metering roller 12, are received in self-aligning bearings 38 to rotatably secure metering roller 12 in pressure indented relation with transfer roller 10.

It should be readily apparent that rotation of pressure adjustment screws 42 will move opposite ends of metering roller 12 relative to the axis of transfer roller 10 for controlling pressure between transfer roller 10 and metering roller 12.

Suitable means is provided for establishing and maintaining a desired angular relationship between throw-off link 16 and skew arm 28. In the form of the invention illustrated in the drawing a lock bolt 50 extends through an aperture in lug 52 on skew arm 28 and is received in an arcuate slot 54, having a center of curvature coincident with the axis of transfer roller 10, formed in a lug 56 on throw-off link 16.

It should be readily apparent that bolt 50 can be loosened permitting rotation of skew arm 28 about the axis of transfer roller 10 and tightened to maintain a desired angular relationship between throw-off link 16 and skew arm 28.

Side frames 2 and 4 have suitable adjustable stop means such as angle members 5 having set screws 5*a* extending therethrough for engaging throw-off links 16 and 18 when rods of throw-off cylinders 24 and 26 are extended for establishing a desired pressure relationship between the transfer cylinder 10 and an ink coated form roller arranged to transfer dampening fluid to a lithographic printing plate as will be hereinafter more fully explained.

Shaft 32 extending outwardly from the end of transfer roller 10 has a gear 60 secured in meshing relation with a gear 62 rotatably disposed on shaft 58 secured to side frame 4.

Gear 62 is secured to a pulley 64 driven by a pulley 66 through a timing belt 68. Pulley 66 is secured to the shaft of variable speed drive means such as electric motor 69.

Shaft 46, extending outwardly from the end of metering roller 12, has a gear 70 secured thereto in meshing relation with an idler gear 71. Idler gear 71 is driven by a gear 72 rotatably secured to shaft 58.

Gear 72 is secured to pulley 74 which is driven by a pulley 76 through a timing belt 78. Pulley 76 is secured to the shaft of variable speed drive means such as electric motor 79.

Power supply lines 80 and 82 are connected through variable rheostats 84 and 86 to terminals of motors 69 and 79, respectively, so that motors may be run at variable speeds to independently control the speed of rotation and consequently, surface speeds of transfer roller 10 and metering roller 12.

Suitable means is provided for delivering an abundant supply of dampening fluid to the nip N between adjacent surfaces of transfer roller 10 and metering roller 12.

In the particular embodiment of the invention illustrated in FIG. I a portion of the surface of metering roller 12 is submerged in dampening fluid 14*a* in dampening fluid pan 14.

The dampening fluid may be moistening fluid such as water with other ingredients added thereto, such as material to lower the surface tension of the water for reducing the tendency of the water to form globules on the surface of ink which would prevent uniform distribution of a film of dampening fluid over a film of ink.

Dampening fluid 14*a* preferably comprises a mixture of water and water soluble, volatile organic liquid such as alcohol, esters, ketones, and similar compounds which are compatible with, and receptive to, oil-based ink. Commercial grade alcohol is preferably employed because of its economy and ready availability. Such material is molecularly compatible with ink because the vehicle of the ink is organic material and the dampening fluid containing alcohol is organic material.

Preferably a watery, highly volatile alcohol such as ethyl alcohol, methyl alcohol or isopropyl is used.

It has been found that mixing 10 to 25% alcohol with water works satisfactorily for most printing operations. Dampening fluid containing alcohol is quickly absorbed in the inking system because it is ink compatible and rides on the surface of ink coated form rollers in a uniformly thin layer and evaporates quickly. Upon evaporation alcohol does not cause oxidization as does water and provides a cooling agent for the rollers running in contact.

The transfer roller 10 is preferably metal and has an exterior surface which is highly machined and polished and treated so as to render same moisture receptive or hydrophillic. Preferably the surface of roller 10 is chrome plated, and is polished and treated after chrome plating, so as to render it hydrophillic, and at the same time make the surface perfectly smooth insofar as possible so that no irregularities or coarse areas thereof present a surface for the depositing of ink thereon by reason of the puncturing or breaking of the film or membrane of dampening fluid deposited thereon, as it rotates under pressure with a form roller, as will be hereinafter more fully explained. Peaks of irregularities, or coarse surface areas, puncturing and extending through a dampening fluid membrane, would contact ink on the surface of the form roller, causing transfer of ink back to the dampening system. The surface of roller 10 should be ground and polished to provide a surface smooth finish within a range of 0.5 to 500 RMS micro-inch. Best results have been obtained with a finish of 5 micro-inch.

It has been found that a chrome surface is readily susceptible to the formation of chrome oxide thereon when exposed to air during normal manufacturing pro-

cesses, which prevents the surface from being water receptive or hydrophillic. Such chrome oxide also provides a hydrophobic or chemically greasy surface, which would provide an attraction for ink. The treatment hereinafter described is for the purpose of removing chrome oxide from the surface of the transfer roller 14 and preventing same from reforming thereon after such treatment.

One method of treatment comprises bathing the chromium surface with a solution of one part hydrochloric or sulfuric acid, one part gum arabic water solution, 14° Baume, and one part water. The acid dissolves and removes the chromium oxide, and the gum arabic coats the surface of the chrome to prevent further oxidization. The period of time which the chromium surface must be exposed to this mixture depends upon the time between the chromium plating and machine processing of the surface, and the treatment. The longer the surface is exposed to the air the greater will be the accumulation of chromium oxide. It has been found that the surface of the roller 10 so treated will pick up a uniform film of moisture from the nip N between transfer roller 10 and metering roller 12 and such film of dampening fluid on roller 10 is rotated to contact the surface of the ink coating on the surface of form roller 90.

Transfer cylinder 10 preferably comprises a hollow tubular sleeve having plugs 10a in the ends thereof on which stub shafts 30 and 32 are formed. As hereinbefore explained, stub shaft 30 extends through bearings in skew arm 28 and throw-off link 16 and stub shaft 32 is rotatably journaled in a bearing in the upper end of throw-off link 18.

Metering roller 12 preferably comprises a hollow tubular sleeve 12s having plugs 12p extending into opposite ends thereof. Plugs 12p have stub shafts 44 and 46 formed thereon.

A resilient cover 12c is secured about the outer surface of sleeve 12s. The preferred process for forming resilient cover 12c is described in U.S. Pat. No. 3,514,312 to provide a roller comprising the metal substrate 12s having an adhesive bonded to it, a layer of relatively hard plastic bonded to the adhesive, and a layer of softer plastic fused to and co-mingled with the intermediate layer of harder plastic.

To reduce the tendency of dampending fluid to accumulate adjacent the ends of transfer roller 10 metering roller 12 is longer than transfer roller 10 such that ends of the metering roller 12 extend beyond the ends of transfer roller 10. The transfer roller 10 is preferably longer than form roller 90 to minimize accumulation of excess dampening fluid adjacent ends of form roller 90.

A modified form of the apparatus for metering dampening fluid is illustrated in FIG. III.

In the apparatus illustrated in FIG. III the means for delivering an excess of dampening fluid to the nip N between transfer roller 10 and metering roller 12 comprises a pan roller 10' having a portion of the surface thereof moving through dampening fluid 14a in pan 14 and being disposed in pressure indented relation with metering roller 12. Pan roller 10' preferably has a hydrophillic surface thereon, that is, dampening fluid receptive and ink rejecting, prepared as hereinbefore described in the description of transfer roller 10.

In some applications small quantities of ink might become mixed with dampening fluid 14a in pan 14. Roller 10' having a surface which is ink rejecting prevents transfer of ink floating on the surface of dampening fluid 14a in pan 14 to the surface of the metering roller 12 and also pre-meters a film of dampening fluid onto the surface of the metering roller 12.

Pan roller 10' is preferably driven by a variable speed drive motor 79'. Providing metering in a sequence of steps at nips N' and N allows adjustment of pressure at the respective nips to render the metering apparatus less responsive to changes in roller speed for allowing a substantial change in relative speeds of the various rollers while making only slight changes in the thickness of the respective metered films.

Referring to FIG. II of the drawing, transfer roller 10 is preferably positioned in pressure indented relation with a form roller 90 having a metal tubular core 91, to the ends of which are secured stub shafts extending outwardly therefrom and rotatably journaled in bearings carried by links 92 pivotable about a shaft 93 rotatably secured to the side frames of a printing press and carrying an inker vibrator roller 94.

A connector 95 is pivotally secured to the links 92 and throw-off links 16 and 18 and is positioned such that the surface of roller 90 is separated from the surface of the printing plate 112 and from the surface of transfer roller 10 when the dampener is thrown off.

Roller 90 has a smooth resilient outer cover 96 which is preferably non-absorbent.

Roller 94 is preferably a vibrator roller of conventional design and is adapted to apply a film of ink 100 to surfaces of form rollers 90 and 90a.

The operation and function of the apparatus hereinbefore described is as follows:

Pressure between ends of transfer roller 10 and metering roller 12 is adjusted by rotating pressure adjustment screws 42.

Since long rollers urged together in pressure relation tend to deflect or bend, pressure adjacent centers of such rollers is less than pressure adjacent ends thereof. Pressure longitudinally of rollers 10 and 12 is adjusted by loosening bolt 50 and rotating skew arm 28 about the axis of transfer roller 10 to a position wherein a desired pressure distribution longitudinally of rollers 10 and 12 is obtained.

Adjustment screw 5 is positioned to engage throw-off links 16 and 18 for establishing a desired pressure between transfer roller 10 and form roller 90.

The surface speeds of rollers 10 and 12 are independently regulatable by manipulating rheostats 84 and 86 as has been hereinbefore explained.

For the purpose of graphically illustrating the novel function and results of the process of the mechanism hereinbefore illustrated and described, an enlarged, exaggerated, diagrammatic view of the metering roller 12, the transfer roller 10 and the form roller 90 is shown in FIG. II.

As shown in such exaggerated illustration, metering roller 12, which is preferably a resilient surfaced roller having a smooth surface 12c thereon, has the lower side thereof immersed in dampening fluid 14a in pan 14. The roller 12 is in rotative contact with transfer roller 10, and the pressure therebetween is adjusted as hereinbefore described, so that the surface of transfer roller 10 is actually impressed into the surface of roller 12 as indicated at nip N.

As roller 12 rotates toward the nip N between rollers 10 and 12, a relatively heavy layer of dampening fluid, indicated at 101, is picked up and lifted on the surface of roller 12, and at the point of tangency, a cusp area at the nip N, between the rollers 10 and 12, a bead 102 of

dampening fluid is piled up, the greatness of which is regulated by virtue of the fact that excess dampening fluid will fall back into the pan 14 by gravity, thus virtually creating a waterfall. The bead 102 becomes a reservoir from which dampening fluid is drawn by transfer roller 10. As rollers 10 and 12 rotate in pressure indented relation, a relatively thin layer of dampening fluid is metered between adjacent surfaces of the two rollers, as indicated at 103. Since the transfer roller 10 is treated to provide a smooth, hydrophillic surface thereon, a portion of the film 103 adheres to the surface of roller 10 as indicated at 104, the remaining portion 105 thereof being rotated back to fluid 14a in the pan 14. The film of dampening fluid 104 is evenly distributed on the surface of roller 10 by reason of the rotating, squeezing action between rollers 10 and 12 at their tangent point at nip N.

The film of dampening fluid 104 rides on the surface of roller 10 and comes in contact with the film 100 of viscous ink on form roller 90 at the tangent point between said rollers, as indicated at 106.

At tangent point 106 it will be observed that transfer roller 10 is impressed into the resilient surface of form roller 90 and that the film of dampening fluid 104 has an outer face 108, contacting ink film 100, and an inner face 110 adhering to the surface of roller 10 and actually separates the surface of transfer roller 10 from the film of ink 100 on form roller 90, so that there is in fact a hydraulic connection between rollers 10 and 90 as they rotate in close relationship, but there is no physical contact therebetween. The film of ink 100 is actually separated from the smooth surface of roller 10 by the film of dampening fluid 104.

It is an important fact to note that the film of dampening fluid 104 permits rollers 10 and 90 to be rotated at different surface speeds as will be hereinafter explained. Preferably, the form roller 90, which is normally rotated at the same surface speed as the lithographic printing plate 112, is rotated at a greater surface speed than the surface speed of roller 10, however, it will be understood that transfer roller 10 could be rotated at a greater surface speed than applicator roller 90 and accomplish the same functions and result as hereinafter related. By regulating the differential surface speed between transfer roller 10 and applicator roller 90 the amount of dampening fluid applied to the plate 112 may be regulated.

Within limits, as will be hereinafter more fully explained, if the surface speed of transfer roller 10 is increased the dampening fluid film 104 is presented at the tangent point 106 at a faster rate and more dampening fluid is transferred on the surface of ink film 100 to lithographic printing plate 112, and the opposite is true, if the surface speed of roller 10 is decreased. However, for a given pressure adjustment, if rollers 10 and 12 were geared together to provide a fixed differential speed relationship, limits are reached wherein further increase in surface speed of roller 10 would result in reduction in the thickness of the film 104 and consequently a reduction in the quantity of dampening fluid delivered to plate 112.

The film of dampening fluid 104, existent between adjacent surfaces of rollers 10 and 90, permits rollers 10 and 90 to be rotated at different surface speeds in sliding relationship, because the film of dampening fluid 104 actually constitutes a lubricant which permits slippage between adjacent surfaces of rollers 10 and 90 without frictional deterioration. By reason of the slippage between rollers 10 and 90, the dampening fluid film 104 is calendared, smoothed out, metered and distributed between adjacent surfaces of roller 10 and the ink film 100 on form roller 90, and the thickness and amount thereof is actually regulated by such means.

While some slippage between adjacent surfaces of transfer roller 10 and form roller 90 is desirable and contributes to effective operation of the apparatus, excessive slippage is detrimental. Transfer roller 10 preferably is driven at a surface speed which is within a range of for example, 500 feet per minute slower or faster than the surface speed of form roller 90. For example, if a printing press has paper travelling therethrough at a surface speed of 1200 feet per minute the surface of the printing plate 112 and surfaces of form roller 90 will ordinarily have surface speeds of 1200 feet per minute. The surface speed of transfer roller 10 would preferably rotate at a surface speed in a range between 700 feet per minute and 1700 feet per minute.

Excessive slippage between adjacent surfaces of transfer roller 10 and form roller 90 increases hydraulic forces acting upon ink film 100 and dampening fluid 104 which is believed to result in emulsification of the ink and dampening fluid in the nip 106 resulting in transfer of ink to the nip N between transfer roller 10 and metering roller 12, which has a surface which is receptive to ink even in the presence of dampening fluid. Slippage between transfer roller 10 and metering roller 12 in the presence of ink causes the ink to be calendared into microscopic pores forming streaks on the metering roller surface. This causes irregularities in film 104 carried by transfer roller 10.

The allowable differential in surface speeds of transfer roller 10 and form roller 90 is dependent upon a number of conditions including the degree of attraction of the specific ink for dampening fluid, the thickness of the film of dampening fluid 104 carried by transfer roller 10 and atmospheric conditions including relative humidity and temperature.

Provided the differential speed between surfaces of transfer rollers 10 and form roller 90 does not exceed permissible limits under given operating conditions, the film 104 of dampening fluid will split as rollers 10 and 90 rotate away from a tangent point therebetween in nip 106. A film of dampening fluid 114 adheres to the surface of the film 100 of more viscous ink carried by form roller 90 and a film 116 of dampening fluid adheres to the surface of the transfer roller 10 from whence it is conveyed back to the bead 102 of dampening fluid adjacent nip N.

It has already been explained that the dampening fluid film 104 is smoothed out, distributed, metered, and regulated between the tangent points of rollers 10 and 90. The interface tension between the outer surface 108 of the less viscous dampening fluid film 104, by reason of molecular attraction between the face of the more viscous ink film 100, causes the smoothened and regulated film 104 to cling to the surface of ink 100, which in turn is transferred to the plate at the tangent point between the plate 112 and form roller 90, as indicated at 120.

The lithographic printing plate 112 has hydrophillic, or water liking, non-image areas 121 and oleophillic, or ink receptive, image areas 122 formed on the surface thereof.

At the nip 120 between applicator roller 90 and printing plate 112, the ink film 100 is split, forming

films 125 of ink over oleophillic surfaces 122 on the printing plate. The layer 114 of dampening fluid carried on film 100 of ink is distributed to form a thin film 126 of dampening fluid over hydrophillic areas 121 of the printing plate and over ink 125 thereon.

No appreciable amount of dampening fluid remains on the surface of form roller 90 which is moving away from the nip 120, but such dampening fluid as does remain thereon is transferred on the ink film 128 to the ink film 130 on the ink vibrator roller 94 where the dampening fluid is dissipated and absorbed, to such an extent as to be of no consequence in the inking system.

From the foregoing it should be readily apparent that the improved apparatus for applying liquid to lithographic printing systems offers control of metering at nip N to provide a film 104 of dampening fluid of precisely controlled thickness by adjusting pressure between transfer roller 10 and metering roller 12 and further by controlling surface speeds of the rollers relative to each other. The rate at which the metered film 104 of dampening fluid is offered to film 100 of ink, and also the hydraulic force for obtaining the desired film split while eliminating conditions which cause feedback of excessive quantities of ink with dampening fluid film 116 on transfer roller 10 moving away from the nip 106 is accomplished by the improved structure.

While a preferred embodiment of the invention has been hereinbefore described and illustrated in the attached drawings it should be appreciated that other and further forms of the apparatus can be devised without departing from the basic concept thereof.

For example, one or more redundant rollers might be incorporated in the system for further metering or transferring of films of dampening fluid or ink. It should further be appreciated that either the transfer roller 10 or metering roller 12 could be geared to the press drive, or driven by an independent drive means, for establishing the conditions hereinbefore described for a specified speed range.

However, provision of independently controllable variable speed drive motors 69 and 71 for controlling the speed of rotation of transfer roller 10 and metering roller 12 together with means for adjusting pressure between rollers 10 and 12 and between roller 10 and 90 produces superior results under variable operating conditions and at varying press speeds.

Having described my invention I claim:

1. A method of metering dampening fluid onto a moving film of ink comprising the steps of:
- metering a film of dampening fluid between independently driven rollers positioned in pressure indented relation;
- moving the film of dampening fluid into contact with a surface of the film of ink such that contacting surfaces of the film of ink and the film of dampening fluid move at different surface speeds;
- maintaining the speed differential between the surface of the ink film and the film of dampening fluid to within a range wherein the film of dampening fluid is split, transferring a portion of the film of dampening fluid to the surface of the ink;
- rotating the metering roller such that the surface speed thereof is less than the surface speed of the ink film.

2. A method of dampening a plate on a lithographic press comprising the steps of:
- depositing a layer of dampening fluid on the surface of resilient metering roller;
- rotating the layer of dampening fluid against the surface of a hard hydrophillic transfer roller in pressure indented relationship therewith;
- metering a film of such dampening fluid from said layer between the surfaces of said rollers;
- transporting the metered film to the surface of an ink coated roller; and
- controlling the relative speeds of rotation of the rollers such that there will be slippage therebetween.

3. The method called for in claim 2 wherein the relative speeds of rotation of the rollers is such that fluid will not be separated from the surfaces thereof by centrifugal force.

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[54] **PIN REGISTER MOUNTER AND METHOD OF MOUNTING FLEXOGRAPHIC PLATES**

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[52] **U.S. Cl.** **101/486**; 101/DIG. 36

[58] **Field of Search** ..... 101/378, 415.1, DIG. 36, 101/485, 486, 401.1; 33/614, 617, 618, 621

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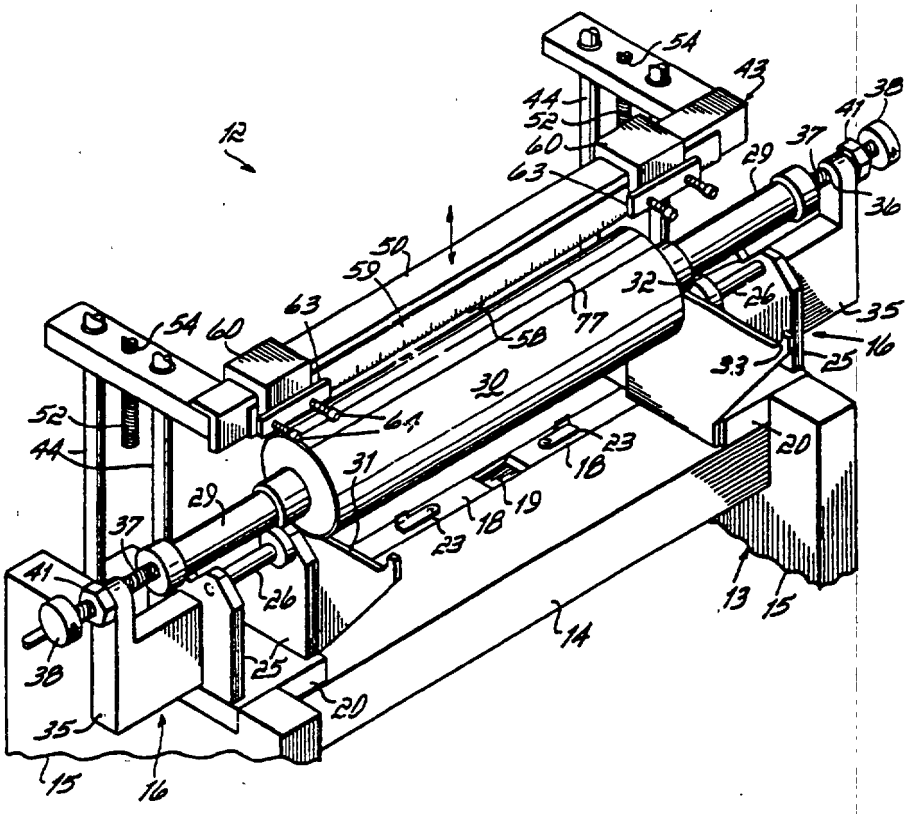
[57] **ABSTRACT**

Flexographic printing plates are mounted in precise registration on printing press cylinders for multicolor printing using a registration apparatus. In the preferred embodiment, the apparatus has a support on which a cylinder can be locked in fixed axial and circumferential position. A pair of pin holders slide on a bar parallel to the cylinder axis to set registration pins in precise positions relative to the surface of the cylinder. The bar moves toward the cylinder and places the pin bases on the cylinder surface so the plate is registered on the pins and adhered to the cylinder along the plate centerline and then across its back. The pin holders are set from a template that matches the plates. The locked pin holders and cylinder support allow additional plates to be similarly mounted on other cylinders in precisely corresponding positions, from their centerlines, with reduced error.

20 Claims, 4 Drawing Sheets



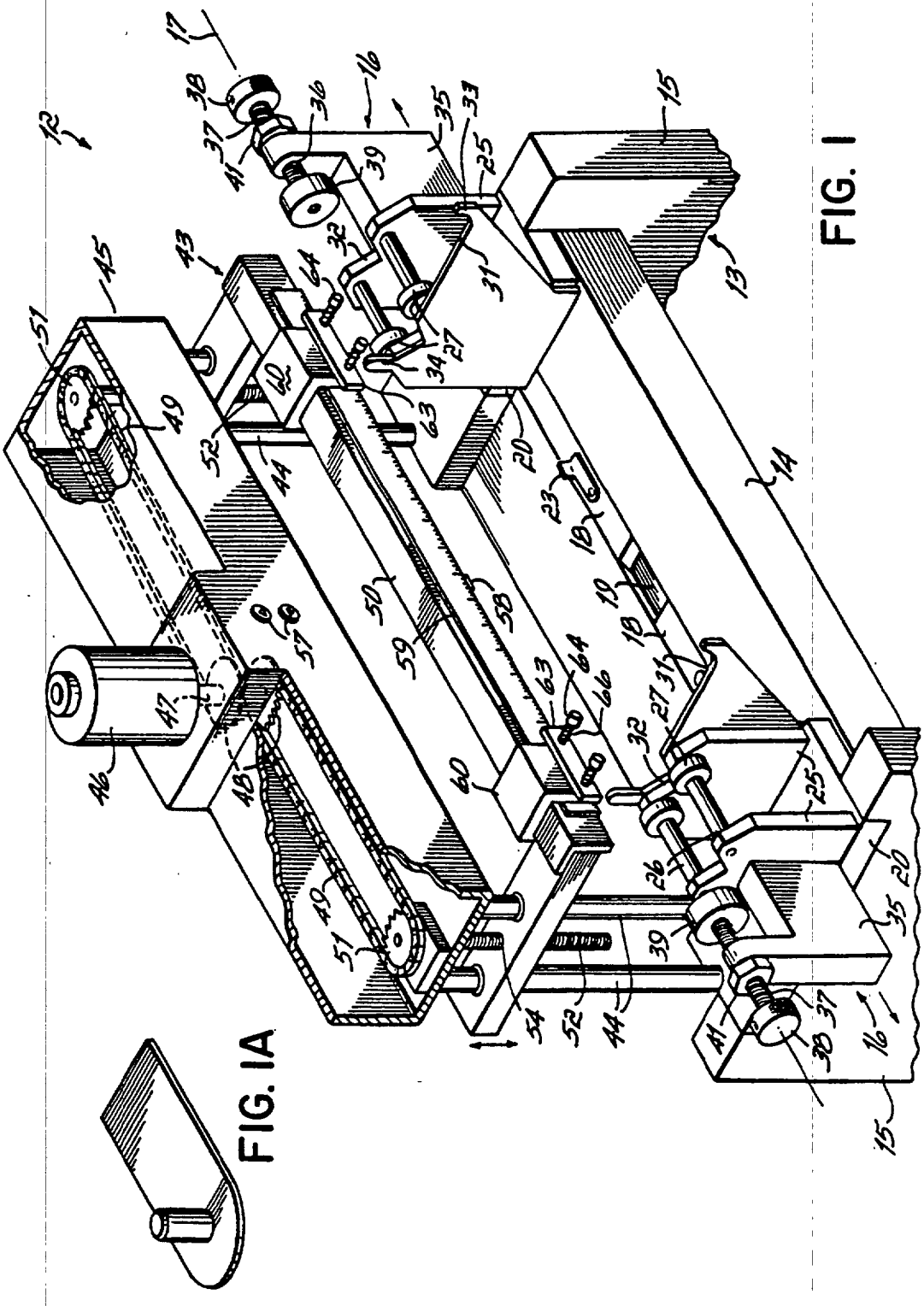


FIG. I

FIG. IA

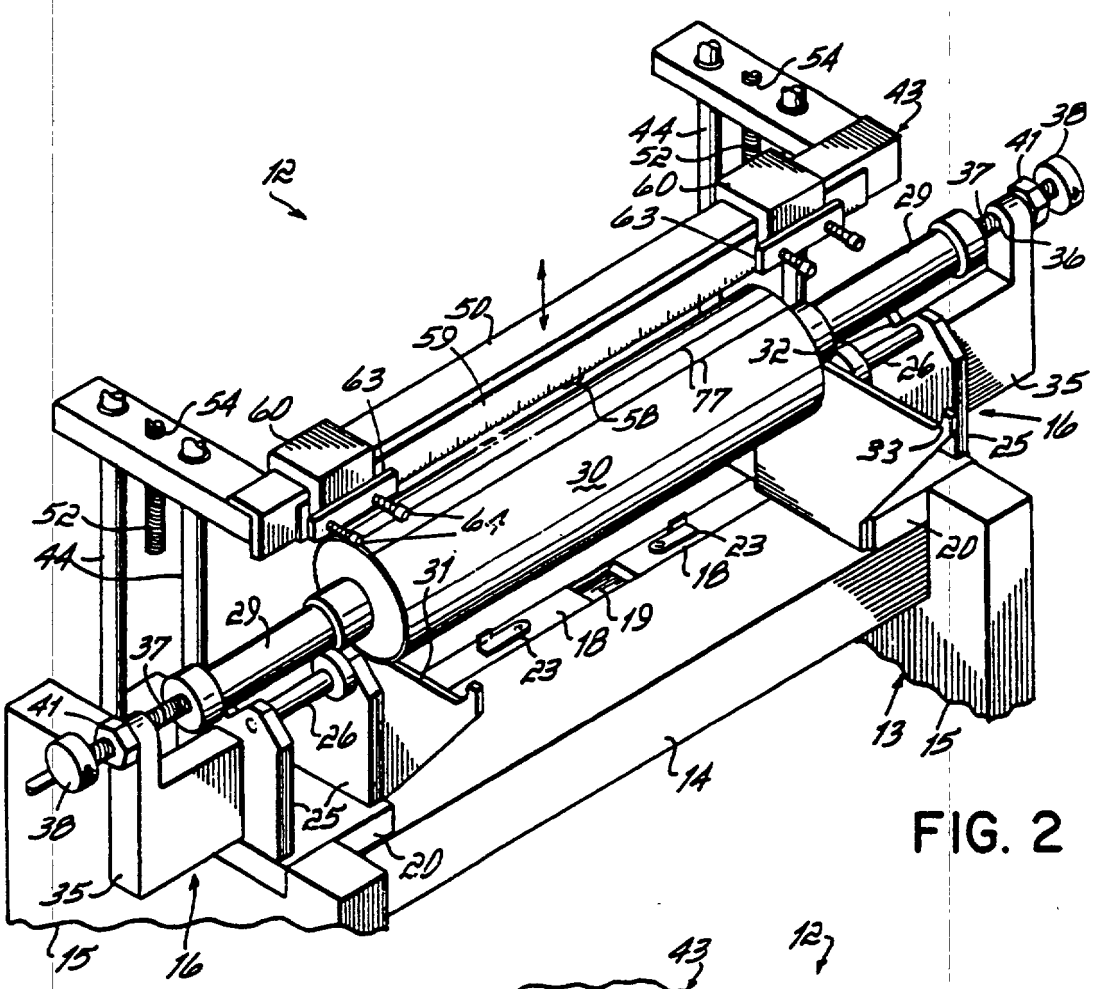

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FIG. 2

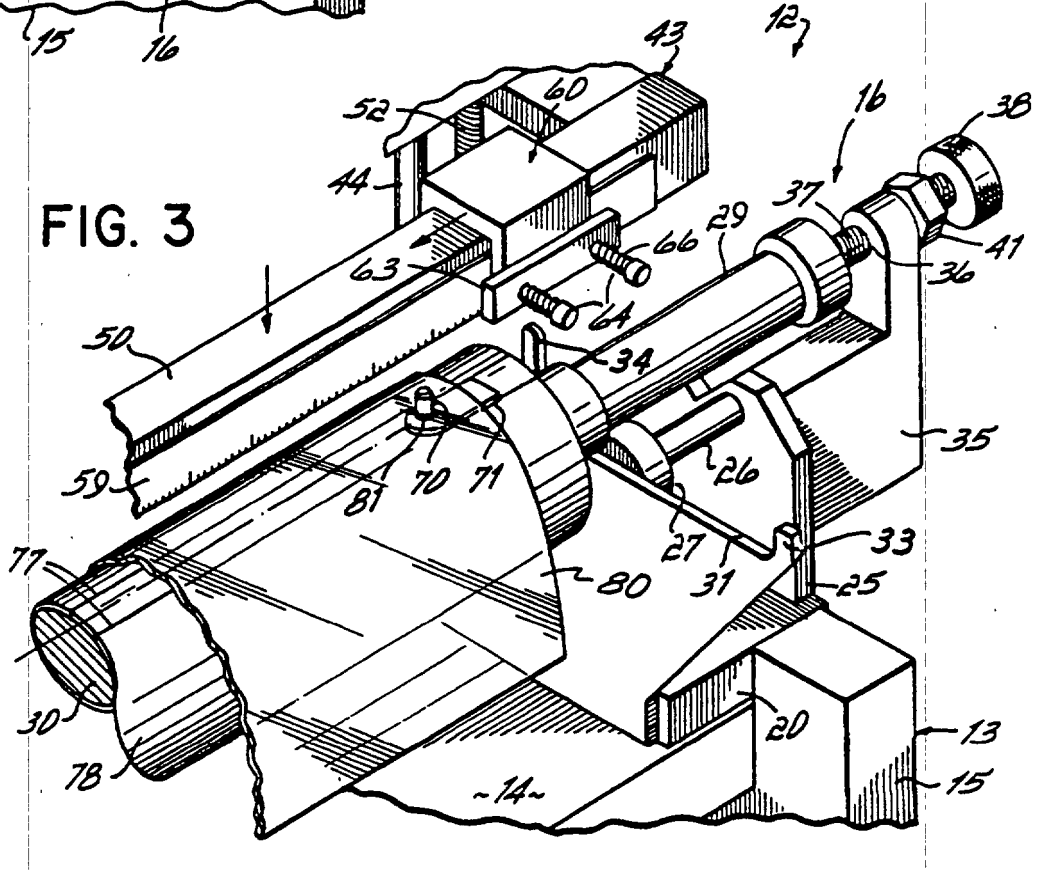
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FIG. 3

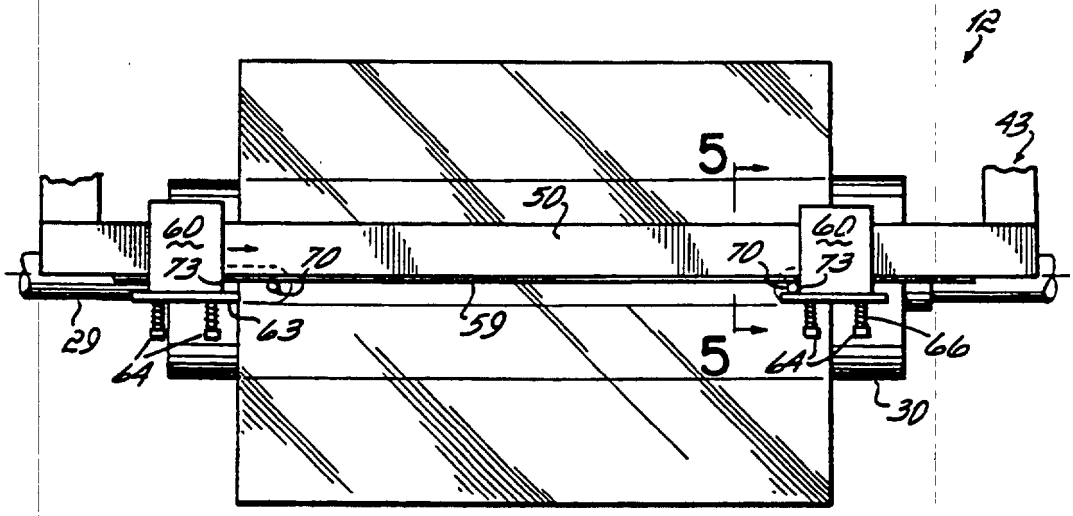

FIG. 4

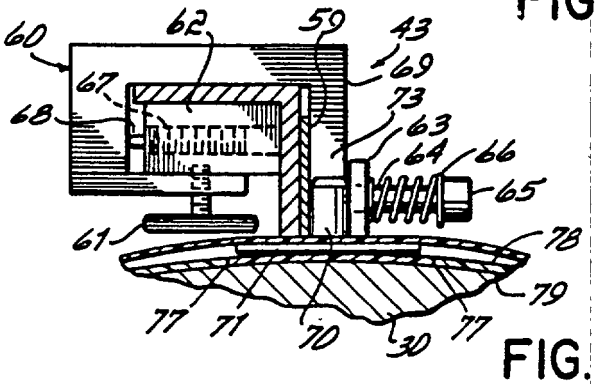

FIG. 5

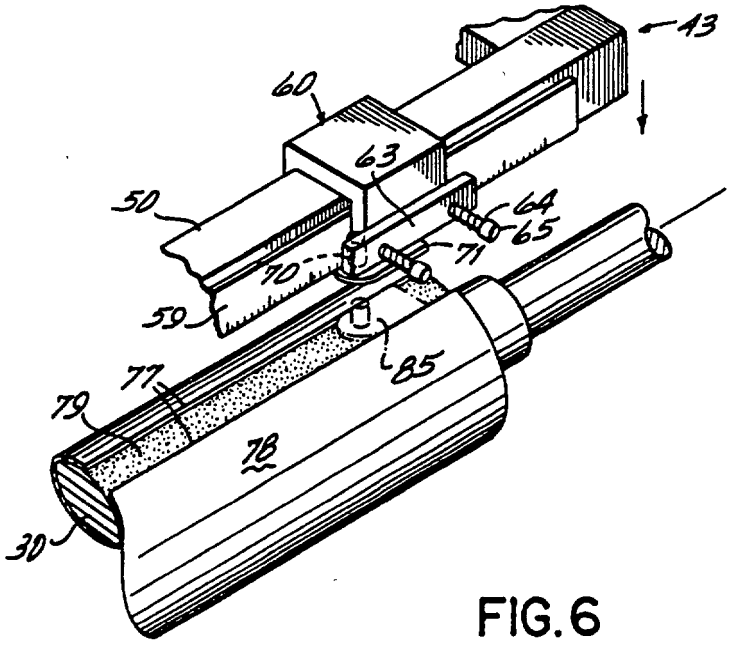

FIG. 6

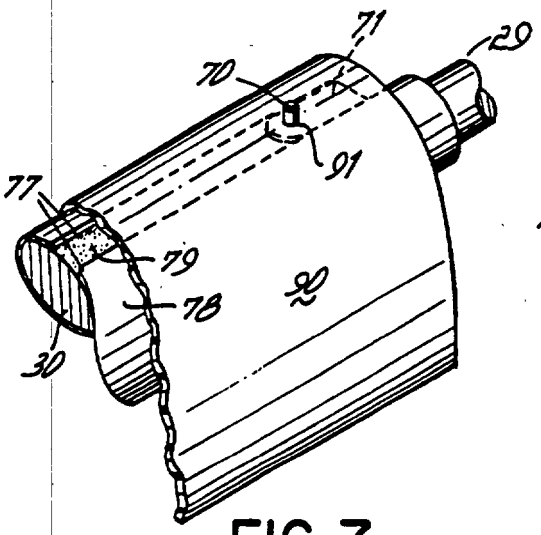

FIG. 7

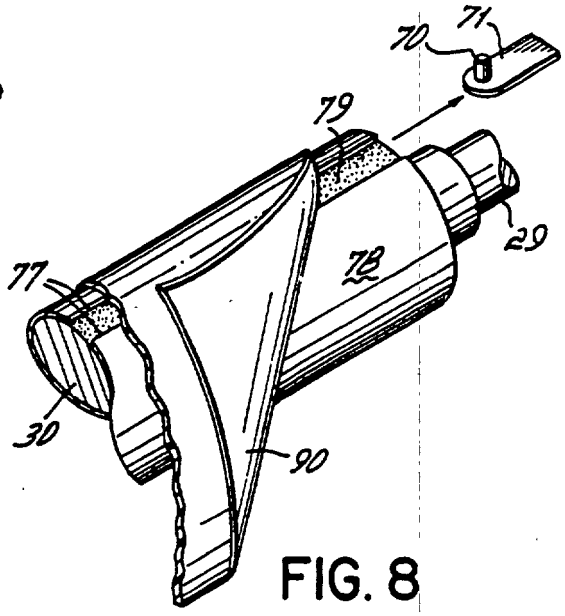

FIG. 8

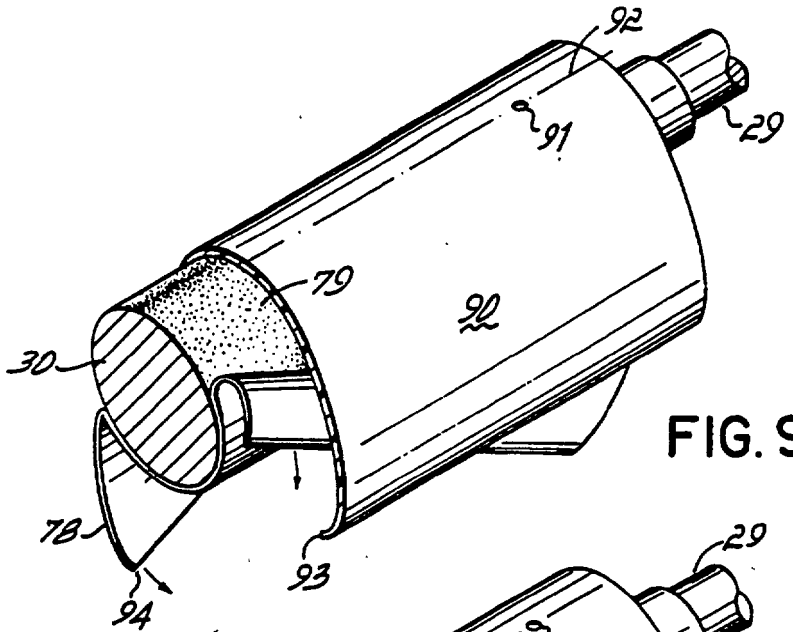

FIG. 9

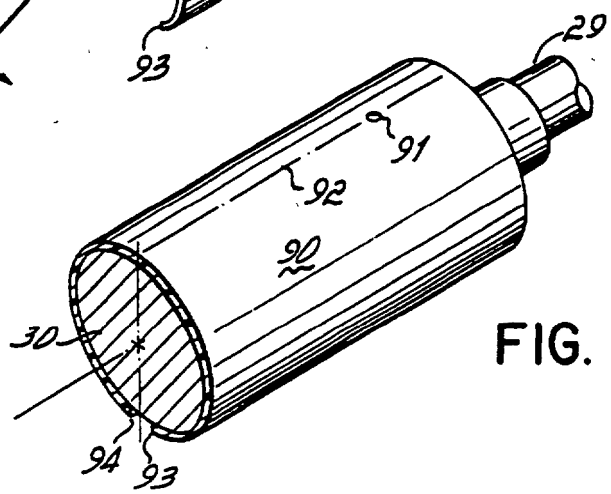

FIG. 10

PIN REGISTER MOUNTER AND METHOD OF MOUNTING FLEXOGRAPHIC PLATES

The present invention relates to the mounting of printing plates, such as photopolymeric mats, to the cylinders of printing presses, and more particularly, to the mounting of different plates of a set of plates to multiple cylinders in precise registration with each other for high quality multiple color printing therewith.

BACKGROUND OF THE INVENTION

In multiple color printing, multiple step printing processes are employed in which different color components of multiple color images are separately imprinted onto the printing stock, usually paper, in a sequence of impressions with a series of separate plates or mats mounted onto separate cylinders of a press. Each of the mats imprints with an ink of a different color. Typically, four colors are employed. In such processes, it is important that the various plates be mounted on the cylinders in precise registration with each other so that the colors precisely align for the production of a high quality multicolor image.

In printing processes that use flexographic printing plates, or flexible photopolymer mats, the plates are usually secured to the cylinders with an adhesive such as a double backed tape, which holds the plates in position during printing. In mounting such plates, care must be taken to register the plates precisely in the same relative position on the respective cylinders. This registration process is often assisted with a mounting apparatus sometimes referred to as a registration system. These registration systems frequently employ pins that receive the mats by engaging a pair of holes made in the mats for registration purposes. The pins are locked into place on a mounting table, and the mats are transferred to the respective cylinders, one at a time, in what is intended to be the same relative position with respect to the respective cylinder. Inevitably, however, some error exists which will cause a slight misregistration of the colors on the printed work which detracts from or limits its quality.

Registration systems of the prior art have operated to engage the mats and transfer them to the print cylinders so as to register one edge of the plate along a line on the surface of the cylinder that is as close to being parallel to the axis of the cylinder, and as consistently located on the surface of the cylinder, as is possible with the equipment.

In such prior art systems, when the edge at one end of the mat is brought into contact with the cylinder surface, it is usually fastened to the surface first at this edge, and then progressively secured across its back surface to edge at its opposite end. In such a process, any error that exists in the registration of the first edge of the mat progressively increases around the cylinder with the distance from the edge of the mat that was first secured.

In one prior art system, it has been proposed to register the mats, begin securing the mats, from their centers. Such system employs pins mountable in holes predrilled into the cylinders to register with holes in the mats. This system has proved impractical because (1) it requires precise location of the holes in the mats to some predetermined positions or spacing, (2) it requires the drilling of multiple sets of holes in the cylinders to accommodate mats of different sizes, and (3) restricts the positioning of the holes in the mats to those of predetermined dimensions and spacing. These disadvantages make it most impractical to mount more than one mat at a time to a cylinder.

The systems of the prior art have been prone to error in the mounting of the plates on the cylinders, have required practice and skill in mounting the plates, and often consume excessive time and repetitive attempts to precisely mount the plates.

The prior art has not provided a flexographic mat registration system and method that is more precise and more practical than those set forth above. Accordingly, there is a need for a more precise, easier to use, and more flexible plate registration method and apparatus.

SUMMARY OF THE INVENTION

It is a primary objective of the present invention to provide a method and apparatus for more precisely registering flexographic mats, particularly mats for multiple color printing, onto the press rolls of a printing press. It is another objective of the present invention to provide a method and apparatus for registering flexographic plates to the cylinders of a printing press in a more flexible, reliable and less time consuming manner.

It is a more particular objective of the present invention to provide a flexible and efficient method and apparatus for precisely registering flexographic plates to printing press cylinders at the centers of the plates, and doing so quickly and precisely, and without restricting the allowable shapes, locations or spacings of registration elements such as the size, shape and location of registration pins. It is a further objective of the invention to provide such a method and apparatus that will not require modification of conventional printing press cylinders.

In accordance with the principles of the present invention, there is provided a method and apparatus by which registration elements are adjustably positioned relative to the surface of printing press cylinders to align with cooperating structure on the flexographic mats. Each plate has a printable image formed thereon in the same fixed relation to a centering line through the approximate center of the image. The elements cooperate with the cooperating structure on the mats to register the mats along a centerline thereof for repeatable positioning of the mat centerline along a precisely located imaginary mounting line on the cylinder surface. The relative positions of the elements with respect to cylinder support structure are maintained as the print cylinders are changed so that other mats of the same set can be applied in precisely the same registration with other cylinders of the press.

In accordance with the preferred embodiment of the present invention, there is provided a cylinder support having a moveable bar adjacent thereto that includes a track or registration edge aligned with the axis of a cylinder when the cylinder is mounted on the support. The edge is moveable toward and away from the axis of the cylinder mounted on the support and is kept parallel to the axis. The bar contains a pair of registration elements that each include a pin holder. The holders are slidable along the track and thereby adjustable and lockable to any of an infinite plurality of axial positions with respect to the cylinder. The holders carry mounting pins and, preferably, can removably receive the mounting pins that will precisely register a mat, by engaging and locating mounting holes in the mats, on the cylinder surface.

In accordance with the preferred embodiment of the invention, removable mounting pins are first positioned in a template, such as a mylar sheet, in holes therein, spaced and located at positions corresponding to the positions of registration holes in the mats. Preferably, the template is used in the process by which the holes are made in the mats, to insure that all of the mats of the set, and the registration pins that locate the mats on the cylinders, are correspondingly located and precisely spaced. The template is used to determine the positions on the bar to which the holders are located. Preferably, the template is draped over the cylinder, the bar is brought next to the cylinder surface, and the template is moved to bring the pins against the bar. This registers the template in the precise orientation with line of the pins along the bar and parallel to the axis of the cylinder. The guide holders, which are slidable along the bar, are slid into engagement with the pins held by the template where they are locked into place. The pins are then removed from the template and removably placed in the holders. preferably held thereto by loose clamps, magnets or other releasable holding techniques.

Preferably, the pins in holders have flat bases that face toward the surface of the cylinder. The cylinder surface is conditioned to secure the pin bases to it by, for example, the removal of a narrow portion of a backing from adhesive tape on the cylinder surface. Then, the bar is moved against the surface to bring the bases of the pins into contact with the adhesive tape, to which they stick and remain secured as the bar is withdrawn. Then, one of the mats is set on the cylinder surface, with a pair of holes on the mat centerline positioned on the pins, and tacked along a strip at its centerline. Then the pins are removed, the remainder of the backing is removed from the adhesive, and the mat is secured by pressing it against the adhesive progressively from the centerline toward the opposite ends of the mat.

The bar is provided with a motor drive that can be actuated to move it toward or away from the cylinder, preferably perpendicular to the axis. The bar is provided with a sensor that detects is proximity to the cylinder surface and signals a drive control circuit that automatically stops the bar. Thus, upon movement toward a cylinder, when the bar lies close to, but does not touch the cylinder surface, the bar is stopped. This feature is effective regardless of what the diameter of the cylinder might be.

The support is provided with a pair of rests that support opposite ends of the shaft of the cylinder in precise parallel relationship to the bar. The rests are moveable axially, parallel to the bar, to accommodate cylinders of differing widths and shifts of differing lengths. The rests also include adjustable ends guides to lock the cylinder in position axially. Also, the support may include an angular indexing mechanism to lock the cylinder circumferentially in preselected angular positions. The locks, as with the positions of the guide holders on the bar, remain locked in their adjusted positions so that, when the cylinders are changed for the mounting thereto of a different mat of the same set, the registrations of each mat with respect to the respective cylinders will be precisely the same. Similarly, the pin holders are set in place for the first mat and remain locked in the same place on the bar for all of the cylinders of the set.

By making it possible to easily register the mats to the cylinders along a line near the center of the mats, the realignment error is reduced and the multiplication of the error at points on the mat farther spaced from the registration line are less because the distance is less. The mounting of the plates in the precise registration proceeds quickly and positively, without the need to repeat the procedure to correct unacceptable errors. As a result, the registration process requires less time and labor and requires less experience and skill. Furthermore, the mats or plates can be placed on the cylinders an any of an infinite plurality of positions because the guides are not restricted to be located in a predetermined number of possible positions.

These and other objectives of the present invention will be more readily apparent from the following detailed description of the invention in which:

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is and isometric view, partially broken away, of a pin registration apparatus embodying principles of the present invention.

FIG. 1A is an isometric view of a flexographic plate registration pin for use as a guide with the apparatus of FIG. 1.

FIG. 2 is an isometric view of the embodiment of FIG. 1 with a printing cylinder supported thereon in preparation for the mountinq of a plate thereto.

FIG. 3 is an isometric view of a portion of the apparatus of FIG. 1 illustrating the use of a pin positioning template.

FIG. 4 is a top view of a portion of the apparatus of FIG. 1 illustrating the setting of pin guide holders with the template of FIG. 3.

FIG. 5 is a cross sectional view of a pin guide holder along the line 5—5 of FIG. 4.

FIG. 6 is an isometric view of a portion of the apparatus of FIG. 1 illustrating the guide bar positioned for the placement of guide pins onto the surface of a print cylinder prepared therefor.

FIG. 7 is an isometric view of a portion of the apparatus of FIG. 1 illustrating the initial positioning and orientation of a printing mat onto a print cylinder.

FIG. 8 is an isometric view illustrating the removal of the guide pins form the print cylinder after the printing mat is initially positioned thereon.

FIG. 9 is an isometric view of a portion of the print cylinder of FIGS. 2–4 and 6–8 illustrating the printing mat being secured to the print cylinder.

FIG. 10 is an isometric view similar to FIG. 9 illustrating the printing mat fully secured to the print cylinder.

DETAILED DESCRIPTION OF THE DRAWING

Referring to FIG. 1, a registration apparatus 12 for mountinq flexographic plates or mats to a printing press cylinder is illustrated. The apparatus 12 includes a floor standing base or frame 13 having a horizontal table 14 supported by a pair of vertical leg members 15 at opposite ends thereof. Depending on the size of the print rolls that the apparatus 12 is expected to handle, the base 13 may be designed to support several thousand pounds of weight.

On the upper surface of the table 14, in the preferred embodiment of the apparatus 12, are slidably mounted a pair of cylinder shaft end rests 16. The rests 16 are slidable to accommodate printing press cylinders of various widths. The rests 16 are transversely aligned on a transverse horizontal axis 17 and are constrained to slide on the table 14 parallel to the axis 17, by a key 18 that slides in a transverse horizontal keyway 19 in the

top surface of the table 14. The keys 18 of the respective rests 16 are fixed to the lower surfaces of slide blocks 20 that constitute the bases of the rests 16. Each of the slide blocks 20 is provided with a locking knob or lever 23 for locking the rests 16 in position on the top of the table 14. The rests 16 may be linked together or geared in such a way as to require both to be equidistant from the center of the table 14, where balance of the cylinder weight is important, or, where unimportant, only one of the rests 16 need be moved or moveable.

The rests 16 each have, projecting upwardly from the slide block 20, a pair of transversely spaced parallel support plates 25. Rotatably mounted between each of the pairs of plates 25 is a pair of horizontally and transversely oriented roller shafts 26, each carrying a roller 27 and both at the same vertical height above the top of the table 14. The rollers 27 of each of the rests 16 are spaced at a distance sufficient for supporting one end of a shaft 29 of an anticipated size of a printing press cylinder 30, as illustrated in FIG. 2.

The innermost one of the plates 25 has an upper edge 31 positioned vertically in line with, or slightly above, the uppermost point on the surface of the rollers 27. Spaced midway between the axes of the rollers 27, in the edge 31, is a notch 32, which curves below the uppermost surface of the rollers 27 so that the shaft 29 of a print cylinder 30, when set vertically down onto the edge 31, will roll over the frontmost one of the rollers 27 of each rest 16 and drop into the notch 32, and upon the rollers 27 to be rotatably supported thereby. Each of the edges 31 has projecting upwardly therefrom a front stop 33 and a rear stop 34 so the roller can be set on the edges 31 and rolled into the notch 32 without rolling off the rests 16.

Extending outwardly in a transverse horizontal direction from the outermost one of the plates 25 of each rest 16 is a locking bracket 35 having a threaded bore 36 therethrough on the axis 17. Extending axially through the bore 36 is a threaded rod 37 having a knurled handle 38 on the outermost end thereof and a teflon disk 39 on the innermost end thereof. The rod 37 is axially adjustable to bring the disks 39 against the opposite ends of the shaft 29 to lock the shaft 29 in axial position on the base 13, and to insure that other identical cylinders of a set of cylinders will be set in exactly the same axial positions on the apparatus 12. The rods 37 may be locked in position by tightening lock nuts 41 against the outermost plate 25.

The rests 16 may also include a mechanism (not shown) for locking a cylinder 30 circumferentially in position and indexing the angular position of the cylinder 30 on the axis 17, for accurate positioning of multiple plates at precise positions with respect to each other on the cylinder 30.

Upstanding from the base 13, above the table 14, and fixed thereto is a registration assembly 43. The assembly 43 includes four vertical supports 44 having supported to the top thereof an elevator drive housing 45. The housing 45 has mounted on the top and at the center thereof an elevator drive motor 46 having a downwardly extending drive shaft 47 projecting into the housing 45. At the lower end of the shaft 47 is a pair of drive sprockets 48. Around each of the drive sprockets 48 extends a drive chain 49. Each of the chains 49 extends around an idler sprocket 51, at a respective one of the two opposite ends of the housing 45, fixed to the end of a drive screw 52. The drive screws 52 are rotatably mounted to the bottom of the housing 45 and extend vertically downwardly therethrough through a threaded hole 54 in a carrier 55 that rides vertically on the two of the supports 44 at the corresponding end of the housing 45.

The two carriers 55 have forwardly extending front ends that project over the axis 17 and have extending between the ends and parallel to, and approximately vertically above, the axis 17, a registration bar 50. The carriers 55 are vertically moveable on the supports 44 so as to raise and lower the bar 50, toward and away from the surface of a cylinder 30 supported on the rests 16, when the motor 46 is energized. The motor 46 is a reversible motor operatable by UP and DOWN buttons 57 on the front of the housing 45. The circuits (not shown) in which the buttons 57 are connected operate the motor 46 to move the bar 50 to a predetermined upper position with respect to the table 20 in response to the momentary depression of the UP one of the buttons 57, and to a predetermined lower position with respect to the surface of a cylinder 30 supported on the rests 16 in response to the momentary depression of DOWN one of the buttons 57. When the UP button 57 is pushed, the bar moves to the predetermined upper position and stops. When the DOWN button 57 is pushed, the bar moves to within a predetermined distance from the surface of the cylinder 30, preferably about 1/16th or ⅛th inch, and stops. The predetermined distance is controlled by a photoelectric proximity sensor 58, mounted on the bottom of the bar 50 at the center thereof. The bar 50 is provided with a scale 59 for facilitating the mounting or centering plates.

Mounted to the bar 50 to slide horizontally along the bar 50 are a pair of registration elements or blocks 60. Each of the blocks 60 includes a locking screw 61, better illustrated in FIG. 5, for locking the block 60 at any of an infinite number of intermediate positions along the continuous length of the bar 50. The screws 61 each drive a locking foot 62 against the bottom of the bar 50 to lock the respective block 60 in position to the bar 50.

On the front of each of the blocks 60 is mounted, in one preferred embodiment, a rectangular clamp 63. The clamp 63 of each block 60 is fitted over a pair of forwardly extending pins 64 on the front of the blocks 60. Each pin 64 has a forward head 65 thereon. Between the head 65 and the clamp 63 extends a compression spring 66, which urges the clamp 63 toward the block 60. Further compression springs 67 are provided in a recess in each locking foot 62 to drive a plunger 68 against the back of the block 60 to hold the front of the block 60 against the front surface of the bar 50.

The blocks 60 each have a front wall 69 dimensioned to hold between the scale 59 on the front of the bar 50 and the clamps 63 a registration pin 70, illustrated in FIG. 1A. A registration pin 70 is fixed and oriented perpendicular to a flat sheet metal tab 71. The thickness or diameter of pins 70 is more than one and less than two times the thickness of the front wall of the blocks 60 so that the pin 70 will be clamped between the scale 59 and the clamp 63 in precise position against a side edge 73 of the wall 69 of the clamp 60, as illustrated in FIGS. 4–6. The pins 70 are held by the springs 66 loosely enough to be pulled from the clamped position on the bar 50 when the tabs are brought into pressure contact with and adhered or otherwise secured to the surface of a cylinder 30, as explained below.

In the preferred method of use of the apparatus 12, referring to FIG. 1, a print cylinder 30 that is one of a set of identical cylinders for use in multiple color print-

ing on a flexographic printing press, set on the rests 16, preferably by lowering the cylinder 30 with a hoist downwardly to place the ends of its shaft 29 onto the edges 31 of the inner ones of the plates 25 and rolling the shaft to bring it into the notches 32, allowing the shaft 29 to rest upon the surfaces of the rollers 27, as illustrated in FIG. 2. This brings the axis of the shaft 29 into general alignment on the axis 17. Then, one or both of the knobs 38 is tightened to bring the disks 39 toward each other to bear against the opposite ends of the shaft 29 to clamp and lock the cylinder 30 axially in a fixed position on the base 13. The cylinder 30 may also be circumferentially aligned and indexed to a particular angular position, which is particularly desirable where multiple plates are to be placed in predetermined relationships to each other on the same cylinder.

Next, the bar 50 is lowered to bring the lower edge of the scale 59 into close proximity to the surface of the cylinder 30 and a pair of horizontal score marks or slits 77 are made in backing tape 78 that covers a layer of backing tape 79 surrounding the surface of the cylinder 30, parallel to the axis 17, and about one inch apart along the upwardly facing side of the cylinder 30 on which the centerline of a printing plate or mat will be placed.

Then, as illustrated in FIG. 3, a template 80 is placed over the cylinder 30. The template 80, as illustrated in FIG. 4, has a pair of registration holes 81 (not shown) aligned along an approximate centerline 82 thereof. The holes 81 in the template 80 are spaced a distance precisely equal to the distance between two registration holes in each of the printing plates 90 (FIGS. 7-10) of a set of plates, and preferably was used for the location of the holes in the plates. The template 80 is set onto the cylinder 30 a pair of pins 70 inserted in the holes 81 thereof, with the tabs 71 against the surface of the cylinder 30, and the pins 70 forward of a vertical plane that contains the front surface and scale 59 of the bar 50 and the axis 17.

The bar 50 is then lowered by momentary depression of the DOWN one of the buttons 57 to energize the motor 46 and bring the lower edge of the bar 50 to a lower rest position spaced $\frac{1}{8}$ inch, for example, from the upper surface of the cylinder 30, with the blocks 60 to one side or the other of the pins 70. When the bar 50 stops in the lowered position, the template 80 is slid rearwardly on the surface of the cylinder 30 until the pins 70 are in contact with the scale 59 of the bar 50, as illustrated in FIG. 4. If desirable, the template may be positioned transversely so that the pins are at a particular position on the scale 59.

When the pins 70 are in their desired positions and against the scale 59 of the bar 50, the blocks 60 are slid horizontally along the bar until the pins 70 are trapped between the clamp 63 and the scale 59, and against the side 73 of the front wall 69 of the blocks 60, as illustrated with the rightmost clamp 60 in FIG. 4 and in FIG. 5. Both blocks 60 are so positioned and locked in place by the tightening of the locking knobs 61. Then, the template 80 is removed, pulling the pins 70 from the blocks 60, and the pins 70 are removed from the holes 81 of the template 80 and reinserted in their clamped positions back on the blocks 60, as illustrated in FIG. 6. Then, the one inch strip of backing tape 78 between the slits 77 is removed, exposing the adhesive of the tape 79 below, and the bar is lowered so as to bring the bottoms of the tabs 71 of the pins 70 against the adhesive along the one inch strip, adhering them thereto. Then the bar 50 is raised, leaving the pins 70 stuck onto the surface of the cylinder 30 along a line parallel to the axis 17 and spaced apart exactly the distance between the holes 81 in the template 80. One of the pins 70 so positioned is illustrated in phantom lines at a position 85 in FIG. 6.

Then, the printing plate or flexographic mat 90, which has a pair of holes 91 spaced at the same distance from each other as the holes 81 of the template 80 and along an approximate centerline 92 thereof, is set onto the cylinder 30 with its holes 91 over the pins 70, and the mat is pressed against the one inch strip of adhesive on the centerline 92 of the mat 90 and near the center of the width of the cylinder 30, enough along the strip to prevent the mat from thereafter moving, as illustrated in FIG. 7. Then mat 90 is lifted near the edges thereof and the pins 70 are removed from the adhesive on the surface of the cylinder 30, as illustrated in FIG. 8, and the mat 90 is then pressed against the adhesive of the strip across the width of the cylinder 30. Then, the remainder of the backing paper 78 is removed from the tape 79 on the cylinder 30, as illustrated in FIG. 9, and the mat is pressed against the cylinder surface from the centerline 92 toward opposite edges 93 and 94 of the mat 90. With this step, the first of the mats 90 is properly registered for printing.

Then, the cylinder 30 on which the first of the mats 90 was mounted is removed from the apparatus 12 by loosening one of the knobs 38 on one of the rests 16, while leaving the other locked in place. The blocks 60 are also left locked in place on the bar 50. Then, the pins 70 are placed in their positions on the blocks 50, a second one of the cylinders 30 of the same set is positioned on the rests 16, aligned and locked into the same place was the first cylinder, as illustrated in FIG. 2, the backing tape 78 is slit and the one inch strip removed, and the pins are positioned on the second cylinder 30 as illustrated in FIG. 6. Then, the second mat 90 is secured to the second cylinder 30 as described in connection with FIGS. 7-10. This mat 90 will thus be in precise registration with the mat on the first cylinder when the two cylinders 30 are mounted on a press. Mats are registered onto the other cylinders of the same set in the same way.

When multiple plates are mounted onto the same cylinders to be registered with corresponding plates on other cylinders of the set so that multiple objects can be printed simultaneously, the corresponding plates are transversely registered using the scale 59, or preferably, multiple block sets 60 are used, or one set of plates is set on all cylinders and before the next set of plates is mounted. These different plates are placed circumferentially by indexing the positions of the cylinders around the axis 17.

The above description is of one preferred embodiment of the invention. Those skilled in the art will appreciate that modifications of the above and additions thereto may be made without departing from the principles of the invention. For example, certain advantages of the invention can be realized without using pins that are removably held to the pin guides or registration blocks on the bar and transferred and removably secured to the cylinders. Registration elements and mat engaging structure other than pin holders and pins may register the mats. Registration elements may also alternatively remain on the blocks on the structure such as the bar, to register the mats exactly in position to be secured to the cylinders without removal of the pins for the bar. This would be accomplished by bringing the

mat with the bar or other such structure against the cylinder to which it is to be secured, for example, thereby pressing it against the exposed tape. Such a bar may be brought up against the cylinder from below so that the mat can be carried face down by the bar and raised against the surface of the cylinder to be secured.

Accordingly, the following is claimed:

1. A method of mounting a flexible printing plate to a printing press cylinder comprising the steps of:

providing a first photopolymer printing plate having two opposite edges, two opposite ends, and two mounting holes therein, one near each of the opposite edges, the holes being spaced a predetermined distance apart along an approximate centerline of the first plate that is generally parallel to and approximately midway between the opposite ends of the first plate;

supporting a first printing cylinder on a horizontal axis with a plate supporting cylindrical surface thereof surrounding the axis at a fixed radius therefrom;

locating a pair of registration pin holders spaced the predetermined distance from each other on a member adjacent the first cylinder and spaced from each other the predetermined distance along a reference line that is parallel to the axis of the first cylinder;

positioning a pair of registration pins, each in one of the holders and spaced the predetermined distance apart along the reference line;

translating the member toward the axis of the first cylinder to carry the reference line approximately against, and the pins into contact, with the surface of the first cylinder each at a respective one of a pair of points axially spaced from each other the predetermined distance along a first axial line on the surface of the first cylinder that is parallel to and between the reference line and the axis;

removably securing the pins to the surface of the first cylinder at the respective points;

moving the member away from the surface of the first cylinder;

placing the first plate on the surface of the first cylinder with the holes thereof centered on the pins;

partially securing the first plate to the surface of the first cylinder along the approximate centerline of the first plate with the approximate centerline thereof in registration with the first axial line on the surface of the first cylinder;

removing the pins from the surface of the first cylinder;

further securing the first plate to the surface of the first cylinder from the first mounting line to the opposite ends of the first plate.

2. The method of claim 1 further comprising the steps of:

providing a second photopolymer printing plate having two opposite edges, two opposite ends, and two mounting holes therein near each of the opposite edges, the holes being spaced the predetermined distance apart along an approximate centerline of the second plate that is generally parallel to and approximately midway between the opposite ends of the second plate;

removing the first cylinder from the support;

supporting a second printing cylinder on the axis with a plate supporting surface thereof surrounding the axis at the fixed radius therefrom;

repositioning the registration pins in the holders;

translating the member toward the axis of the second cylinder to carry the reference line approximately against, and the pins into contact with, the surface of the second cylinder, each at a respective on of a pair of points axially spaced from each other the predetermined distance along a second axial line on the surface of the second cylinder that is parallel to and between the reference line and the axis;

removeably securing the pins to the surface of the second cylinder at the respective points;

moving the member away from the surface of the second cylinder;

placing the second plate on the surface of the second cylinder with the holes thereof centered on the pins;

partially securing the second plate to the surface of the second cylinder along the approximate centerline of the second plate with the approximate centerline thereof in registration with the second axial line;

removing the pins from the surface of the second cylinder;

further securing the second plate to the surface of the second cylinder from the second mounting line to the opposite ends of the second plate;

whereby a plurality of flexible printing plates are registered with respect to each other on a respective plurality of printing cylinders for multiple color printing therewith.

3. The method of claim 2 further comprising the steps of:

removing the second cylinder from the support;

installing the first and second cylinders with the first and second plates respectively mounted thereon in a printing press;

printing a first color image onto a substrate with the first plate; and

overprinting a color image onto the substrate with the second plate in registration with the first color image to produce a precisely registered multiple color image;

whereby a multiple color image is thereby printed on the substrates.

4. The method of claim 1 wherein:

the first plate providing step includes the substeps of providing a template having a pair of guides thereon spaced from each other the predetermined distance, forming the holes in the plate with the guides of the template; and

the locating step includes the substep of locating the pair of pin holders with the guides of the template.

5. The method of claim 4 wherein:

the locating step includes the substep of positioning the pins at the predetermined distance in the guides of the template, locating the pair of pin holders with the pins positioned in the guides of the template.

6. A method of mounting a plurality of printing plates of a set onto a corresponding plurality of printing press cylinders of a printing press in corresponding registered positions with respect to each other for the sequential printing of multicolor images therewith, the method comprising the steps of:

supporting a first printing press cylinder at a fixed position on an axis;

providing, on each of a plurality of printing plates, at least two registration indicia spaced a predeter-

mined distance apart along an approximate centerline thereof, each plate having a printable image thereon at a predetermined position with respect to the indicia;

locating at least two registration elements adjacent the printing surface of the supported cylinder and spaced the predetermined distance apart;

establishing, with the registration elements, two points, at respective registration positions relative to the axis, spaced from each other the predetermined distance and located on a mounting line on the surface of the first cylinder when the first cylinder is supported at the fixed position on the axis;

aligning the registration elements with the indicia on a first plate of the plurality of plates;

respectively positioning the indicia of the first plate over the elements at the points on the surface of the first cylinder and over the cylinder;

securing to the surface of the first cylinder, along the mounting line thereof, a portion of the first plate, along the approximate centerline thereof; then,

securing the remainder of the first plate, progressing from the centerline to opposite ends thereof, to the surface of the first cylinder;

supporting a second printing press cylinder of the plurality of cylinders at the fixed position on the axis such that the two points are spaced from each other the predetermined distance and are located on a mounting line on the surface of the second cylinder when the second cylinder is supported at the fixed position on the axis;

aligning the registration elements with the indicia of a second plate of the plurality of plates;

respectively positioning the indicia of the second plate over the elements at the points on the surface of the second cylinder and over the cylinder;

securing to the surface of the second cylinder, along the mounting line thereof, a portion of the second plate, along the approximate centerline thereof; then,

securing the remainder of the second plate, progressing from the centerline to opposite ends thereof, to the surface of the second cylinder;

whereby the printing plates are mounted to corresponding printing press cylinders in corresponding registered positions with respect to each other for sequential printing of multicolor images therewith.

7. The method of claim 6 further comprising the steps of:

recording the fixed position of the first cylinder on the axis; and

the second cylinder supporting step includes the step of positioning the second cylinder on the axis in response to the recorded fixed position.

8. The method of claim 7 wherein:

the fixed position recording step includes the step of setting an axial stop with respect to an end of the first cylinder; and

the second cylinder positioning step includes the step of positioning an end of the second cylinder that corresponds to the end of the first cylinder with respect to the axial stop.

9. The method of claim 7 wherein:

the fixed position recording step includes the step of setting the first cylinder at a circumferential index position on the axis; and

the second cylinder positioning step includes the step of setting the second cylinder to the circumferential index position on the axis.

10. A method of mounting a plurality of printing plates of a set onto a corresponding plurality of printing press cylinders of a printing press in corresponding registered positions with respect to each other for the sequential printing of multicolor images therewith, the method comprising the steps of:

supporting a first printing press cylinder at a fixed position on an axis;

providing, on each of a plurality of printing plates, at least two registration indicia spaced a predetermined distance apart along an approximate centerline thereof, each plate having a printable image thereon at a predetermined position with respect to the indicia;

locating at least two registration elements adjacent the printing surface of the supported cylinder and spaced the predetermined distance apart;

establishing, with the registration elements, two points, at respective registration positions relative to the axis, spaced from each other the predetermined distance and located on a mounting line on the surface of the first cylinder when the first cylinder is supported at the fixed position on the axis;

aligning the registration elements with the indicia on a first plate of the plurality of plates;

respectively positioning, with the elements, the indicia of the first plate at the points on the surface of the first cylinder and securing to the surface of the first cylinder, along the mounting line thereof, a portion of the first plate, along the approximate centerline thereof; then,

securing the remainder of the first plate, progressing from the centerline to opposite ends thereof, to the surface of the first cylinder;

supporting a second printing press cylinder of the plurality of cylinders at the fixed position on the axis such that the two points are spaced from each other the predetermined distance and are located on a mounting line on the surface of the second cylinder when the second cylinder is supported at the fixed position on the axis;

aligning the registration elements with the indicia of a second plate of the plurality of plates;

respectively positioning, with the elements, the indicia of the second plate at the points on the surface of the second cylinder and securing to the surface of the second cylinder, along the mounting line thereof, a portion of the second plate, along the approximate centerline thereof; then,

securing the remainder of the second plate, progressing from the centerline to opposite ends thereof, to the surface of the second cylinder;

whereby the printing plates are mounted to corresponding printing press cylinders in corresponding registered positions with respect to each other for sequential printing of multicolor images therewith;

the registration element locating step including the steps of positioning a bar parallel to the axis, sliding at least one of the elements along an infinite plurality of possible element positions on the bar, and locking the elements at respective ones of the possible element positions that are spaced the predetermined distance apart; and

the point establishing step and the indicia positioning steps including the step of translating the bar with

respect to the axis to bring the registration elements into approximate contact with the surface of the first cylinder at the two points.

11. The method of claim 10 wherein:

the registration element locating step includes the step of positioning a gage against the bar and spacing the elements the predetermined distance apart therewith.

12. The method of claim 11 wherein:

the indicia providing step includes the step of forming two holes in each of the plates and forming the printable image thereon at positions determined with the gage.

13. An apparatus for mounting flexographic printing plates to printing press cylinders, wherein each plate has a printable image formed thereon in the same fixed relation to a centering line through the approximate center of the image, each cylinder having a cylindrical plate supporting surface and a shaft both centered on an axis thereof, the apparatus comprising:

a cylinder support for supporting a cylinder by its shaft thereon;

means for fixing the position of a cylinder supported on the support in relation to the support;

a track mounted on the support and oriented parallel to the axis of a cylinder supported on the support;

at least two registration elements mounted on the track, at least one of which is axially moveable along the track among an infinite plurality of positions;

means releasably carried by each of the registration elements and transferable therefrom to the surface of the cylinder for engaging the plate at a respective point on the centering line of the image to orient the centering line of the image parallel to the axis of the cylinder at the surface of the cylinder;

the track being moveable toward and away from the axis of a cylinder supported on the support, to present the engaging means and the points on the centering line against the surface of the cylinder each to a unique location on the surface of the cylinder.

14. The apparatus of claim 13 wherein:

the registration elements each include a pin holder slidable on the track parallel to the axis of a cylinder mounted on the support and each including a lock connected between the respective element and the track for selectively fixing the element in any position along a length of the track;

each of the engaging means includes a registration pin dimensioned to fit into a hole at the respective registration point on the centering line of the image to orient;

the track is moveable toward and away from the axis of a cylinder supported on the support, to present each of the pins at a respective one of the unique locations for registering the plate with the holes thereof at the unique locations and with the centering line extending between the locations for the securing of the plate in a registered position on the surface of the cylinder beginning along the centering line thereof.

15. The apparatus of claim 13 wherein:

the cylinder support includes a pair of shaft end rests for rotatably supporting an end of the shaft of the cylinder supported on the support;

the means for fixing the position of a cylinder supported on the support in relation to the support includes adjustable means on the rest for setting the axial position of the shaft on the support.

16. The apparatus of claim 13 wherein:

the cylinder support includes a pair of shaft end rests for rotatably supporting an end of the shaft of the cylinder supported on the support;

the means for fixing the position of a cylinder supported on the support in relation to the support includes adjustable indexing means for setting the circumferential position of the shaft on the support.

17. An apparatus for mounting flexographic printing plates to printing press cylinders, wherein each plate has a printable image formed thereon in the same fixed relation to a centering line through the approximate center of the image, each cylinder having a cylindrical plate supporting surface and a shaft both centering on an axis thereof, the apparatus comprising:

a cylinder support for supporting a cylinder by its shaft thereon;

means for fixing the position of a cylinder supported on the support in relation to the support;

a track mounted on the support and oriented parallel to the axis of a cylinder supported on the support;

at least two registration elements mounted on the track, at least one of which is axially moveable along the track among an infinite plurality of positions;

means carried by each of the registration elements for engaging the plate at a respective point on the centering line of the image to orient the centering line of the image parallel to the axis of the cylinder;

the track being moveable toward and away from the axis of a cylinder supported on the support, to present the engaging means and the points on the centering line against the surface of the cylinder each to a unique location on the surface of the cylinder;

the cylinder support including a pair of shaft end rests for rotatably supporting an end of the shaft of the cylinder supported on the support;

the means for fixing the position of a cylinder supported on the support in relation to the support including adjustable means on the rest for setting the axial position of the shaft on the support;

the registration elements each including a pin holder slidable on the track parallel to the axis of a cylinder mounted on the support and each including a lock connected between the respective element and the track for selectively fixing the element in position on the track, each of the pin holders including means for releasably holding thereagainst a registration pin;

each of the engaging means including a registration pin releasably engagable by the pin holder and dimensioned to fit into a hole at the respective registration point on the centering line of the image, each of the pins having a flat mounting surface thereon securable to the surface of a cylinder; and

the track being moveable toward and away from the axis of a cylinder supported on the support, to secure the pins to the surface of the cylinder at the corresponding one of the unique locations, and moveable away from the surface of the cylinder to cause the pins to be released from the holders.

18. An apparatus for mounting flexographic printing plates to printing press cylinders, wherein each plate has a printable image formed thereon in the same fixed relation to a centering line through the approximate

center of the image, each cylinder having a cylindrical plate supporting surface and a shaft both centered on an axis thereof, the apparatus comprising:

a cylinder support for supporting a cylinder by its shaft thereon;

means for fixing the position of a cylinder supported on the support in relation to the support;

a track mounted on the support and oriented parallel to the axis of a cylinder supported on the support;

at least two registration elements mounted on the track, at least one of which is axially moveable along the track among an infinite plurality of positions;

means carried by each of the registration elements for engaging the plate at a respective point on the centering line of the image to orient the centering line of the image parallel to the axis of the cylinder;

the track being moveable toward and away from the axis of a cylinder supported on the support, to present the engaging means and the points on the centerline line against the surface of the cylinder each to a unique location on the surface of the cylinder;

the registration elements each includes a pin holder slidable on the track parallel to the axis of a cylinder mounted on the support and each including a lock connected between the respective element and the track for selectively fixing the element in any position along a length of the track;

each of the engaging means includes a registration pin dimensioned to fit into a hole at the respective registration point on the centering line of the image to orient;

the track is moveable toward and away from the axis of a cylinder supported on the support, to present each of the pins at a respective one of the unique locations for registering the plate with the holes thereof at the unique locations and with the centering line extending between the locations for the securing of the plate in a registered position on the surface of the cylinder beginning along the centering line thereof;

each of the pins having a mounting surface thereon securable to the surface of a cylinder; and

the track being moveable toward and away from the axis of a cylinder supported on the support, to secure the pins to the surface of the cylinder at the corresponding one of the unique locations, and moveable away from the surface of the cylinder to cause the pins to be released from the holders.

19. The apparatus of claim 18 wherein:

the cylinder support includes a pair of shaft end rests for rotatably supporting an end of the shaft of the cylinder supported on the support; and

at least one of the rests is moveable on the support toward and away from the other of the rests to accommodate cylinder shafts of differing lengths.

20. An apparatus for mounting flexographic printing plates to printing press cylinders, wherein each plate has a printable image formed thereon in the same fixed relation to a centering line through the approximate center of the image, each cylinder having a cylindrical plate supporting surface and a shaft both centered on an axis thereof, the apparatus comprising:

a cylinder support for supporting a cylinder by its shaft thereon;

means for fixing the position of a cylinder supported on the support in relation to the support;

a track mounted on the support and oriented parallel to the axis of a cylinder supported on the support;

at least two registration elements mounted on the track, at least one of which is axially moveable along the track among an infinite plurality of positions;

means carried by each of the registration elements for engaging the plate at a respective point on the centering line of the image to orient the centering line of the image parallel to the axis of the cylinder;

the track being moveable toward and away from the axis of a cylinder supported on the support, to present the engaging means and the points on the centering line against the surface of the cylinder each to a unique location on the surface of the cylinder;

means for moving the track toward and away from the surface of a cylinder mounted on the support;

a proximity sensor carried by the track for detecting the proximity of the track to the surface of the cylinder and generating a signal in response thereto; and

means connected to the track moving means for stopping the track a predetermined small distance from the surface of the cylinder in response to the signal from the sensor.

* * * * *

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United States Patent [19]

Leanna et al.

[11] **Patent Number: 4,704,296**

[45] **Date of Patent: Nov. 3, 1987**

[54] **WEB COATING METHOD AND APPARATUS**

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[73] Assignee: **Magna-Graphics Corporation**, Oconto Falls, Wis.

[21] Appl. No.: **655,901**

[22] Filed: **Sep. 28, 1984**

[51] **Int. Cl.**[4] **B05D 1/28**; B05C 1/12; B05C 11/00

[52] **U.S. Cl.** **427/9**; 118/249; 118/261; 118/262; 118/665; 118/697; 427/10; 427/428

[58] **Field of Search** 427/9, 10, 428; 118/665, 46, 261, 249, 262, 697

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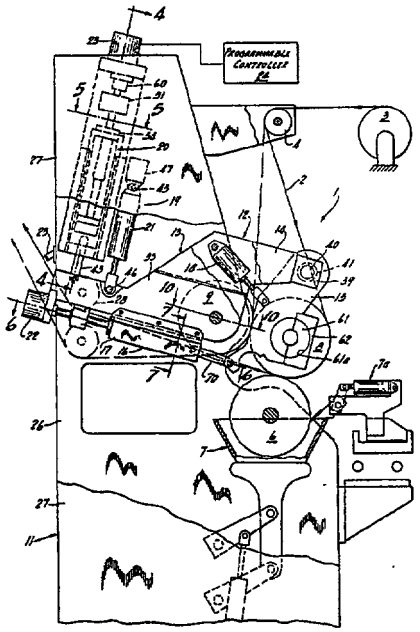
Primary Examiner—Evan K. Lawrence
Attorney, Agent, or Firm—Andrus, Sceales, Starke & Sawall

[57] **ABSTRACT**

A coater includes an impression cylinder and a gravure cylinder rotatably mounted. A first pivot arm unit is pivoted on the impression cylinder shaft and supports a pivot shaft. Depending pivot arms on the shaft support an offset cylinder to one side of the impression cylinder and above the gravure cylinder. Nip adjustment units for the pivot arm unit and the depending pivot arms each include a pre-loaded ball bearing lead screw coupled to a slide housing and a separate power cylinder connected to the pivot unit and pivot arms respectively. The power cylinder unit forces the pivot structure into engagement with the lead screw follower which acts as a stop. A stepping motor rotates the lead screw and accurately positions the stop and thereby the pivot structure as a result of the power cylinder units. The lead screws separately control the nip setting of the off-set cylinder relative to the impression cylinder and the gravure cylinders. The stepping motors may be separately actuated to establish precise parallelism of the cylinders and simultaneously actuated to set the nip position. A coating thickness sensor coupled to the coated web is connected to a programmable controller having an output connected to operate the stepping motors to maintain a selected coating. In the method of operating the apparatus, a direct mode is used to apply coating to a web passing between the gravure and offset cylinders, or an indirect mode is used to apply coating to a web passing between the offset and impression cylinders.

15 Claims, 10 Drawing Figures



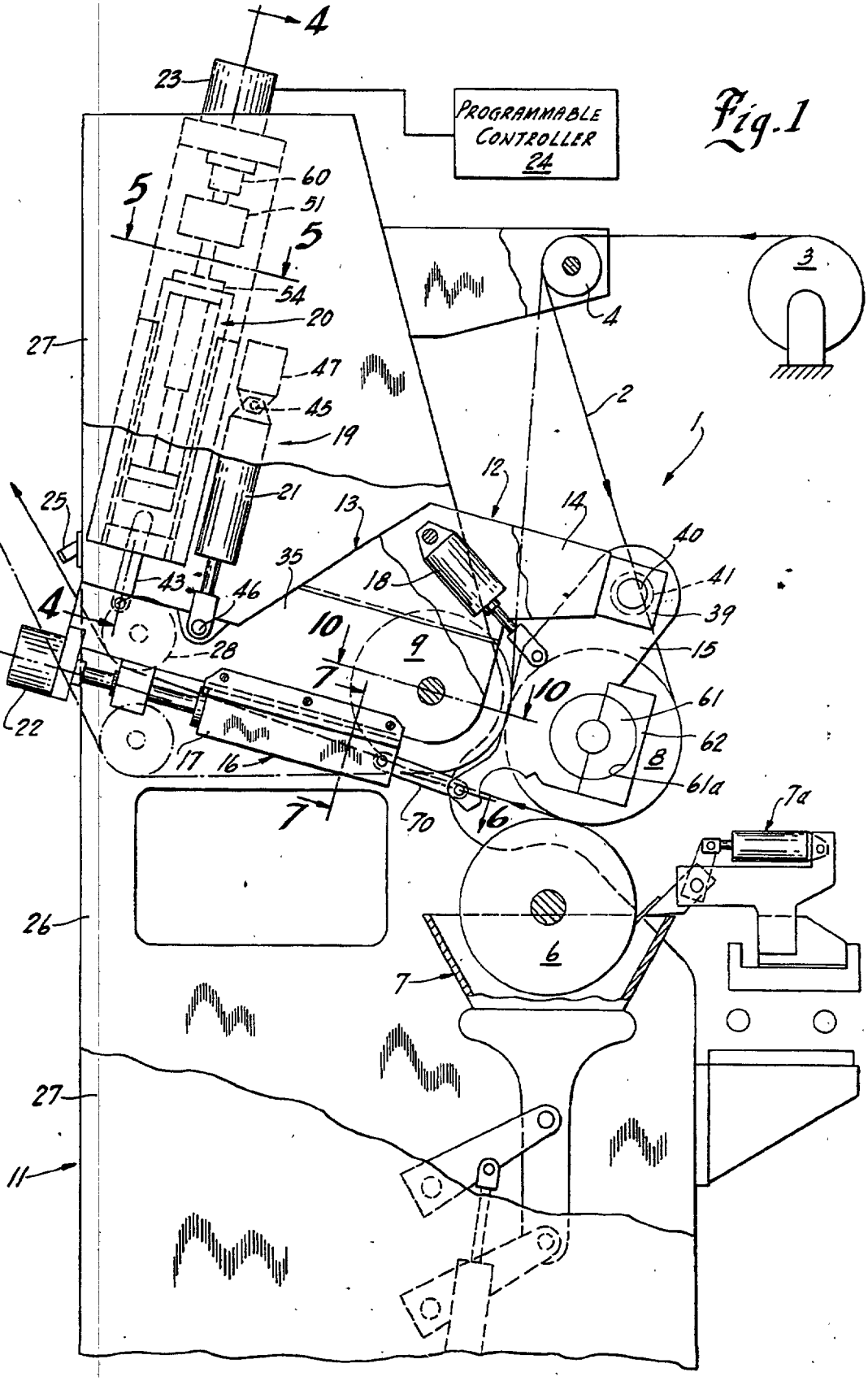

PROGRAMMABLE CONTROLLER 24
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Fig. 1

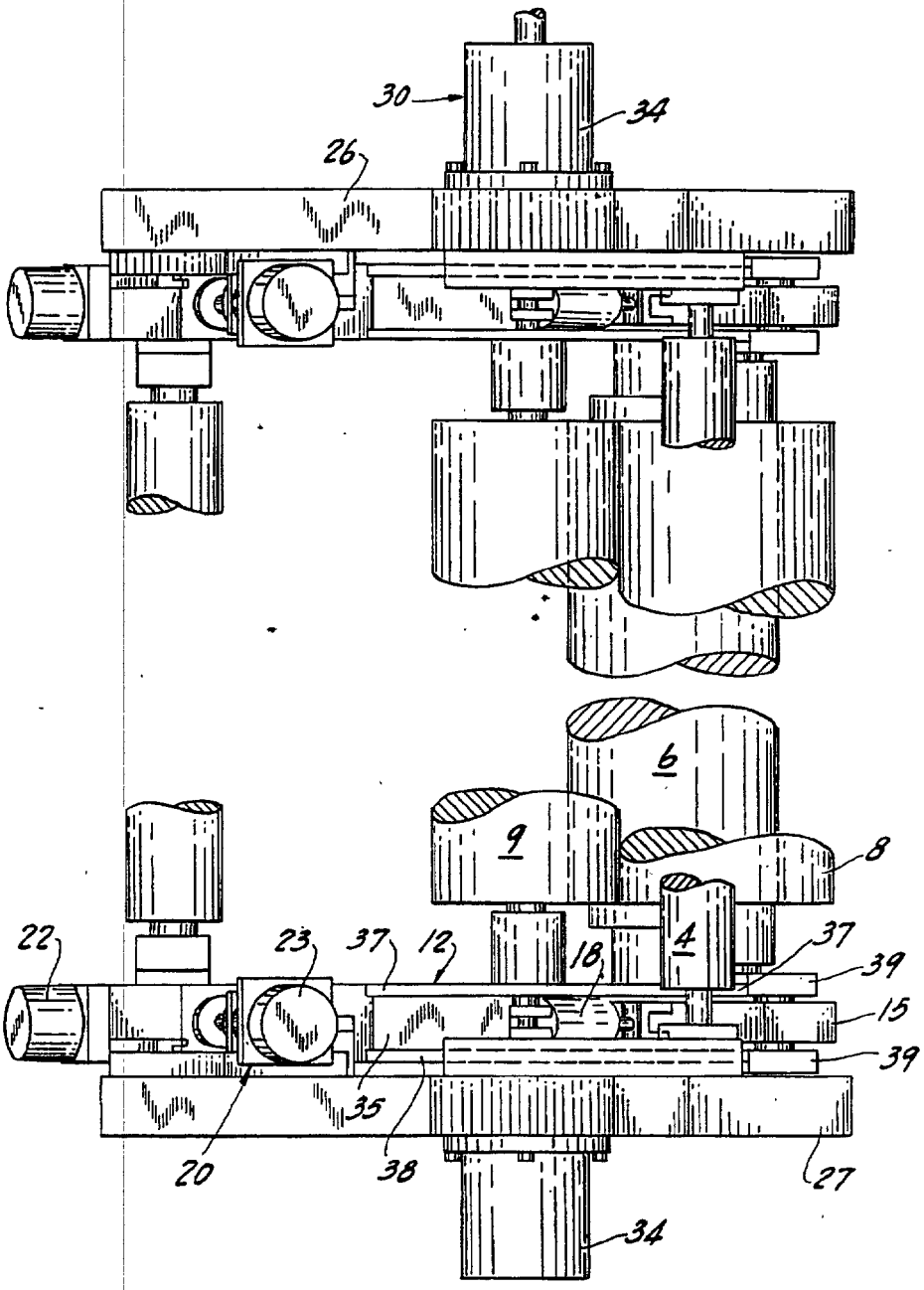


Fig. 2

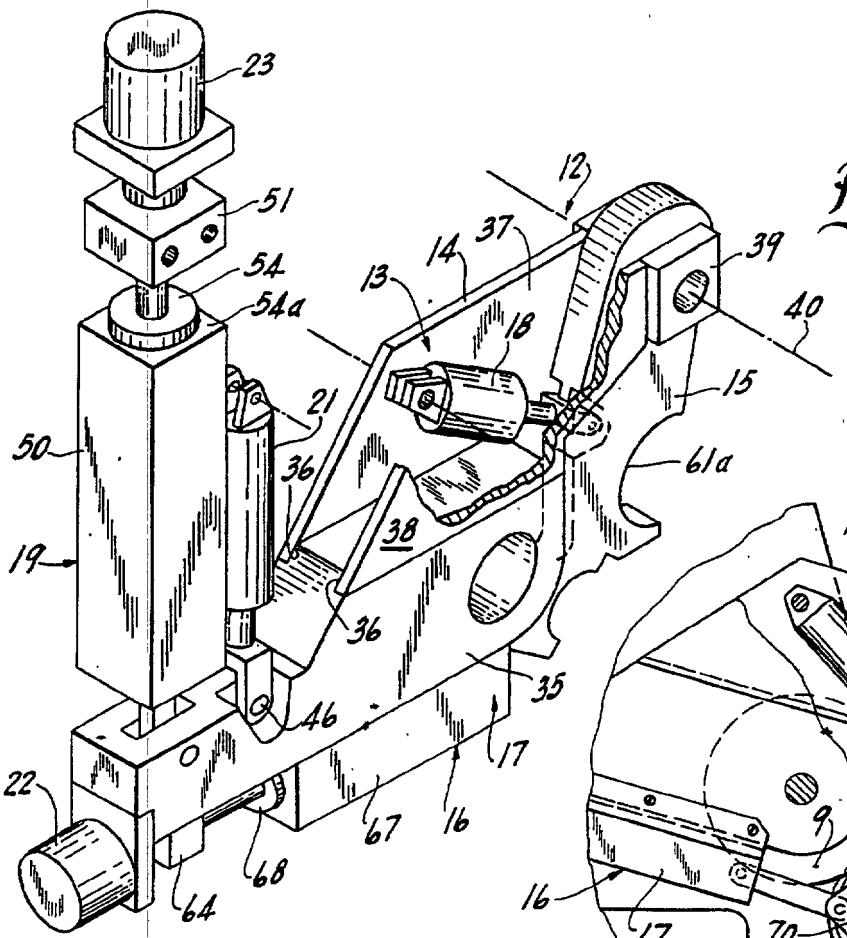


Fig. 3

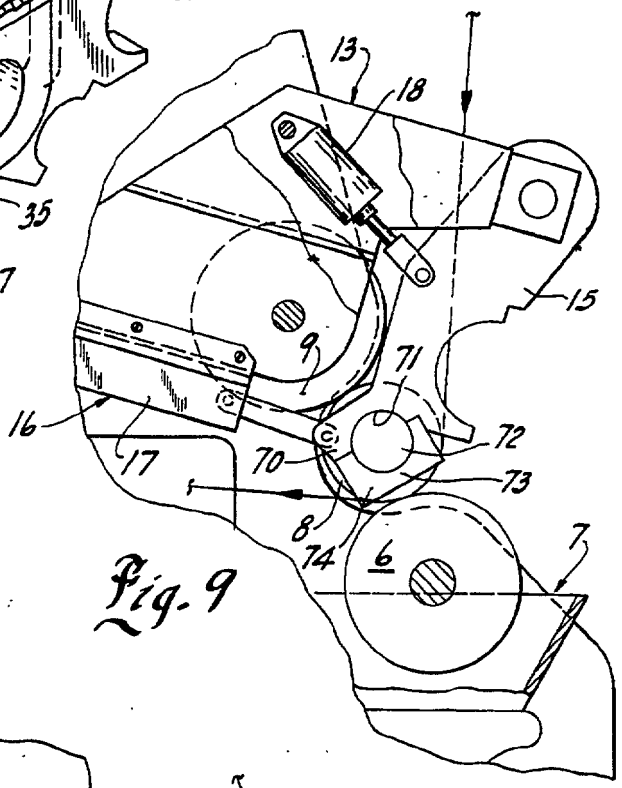
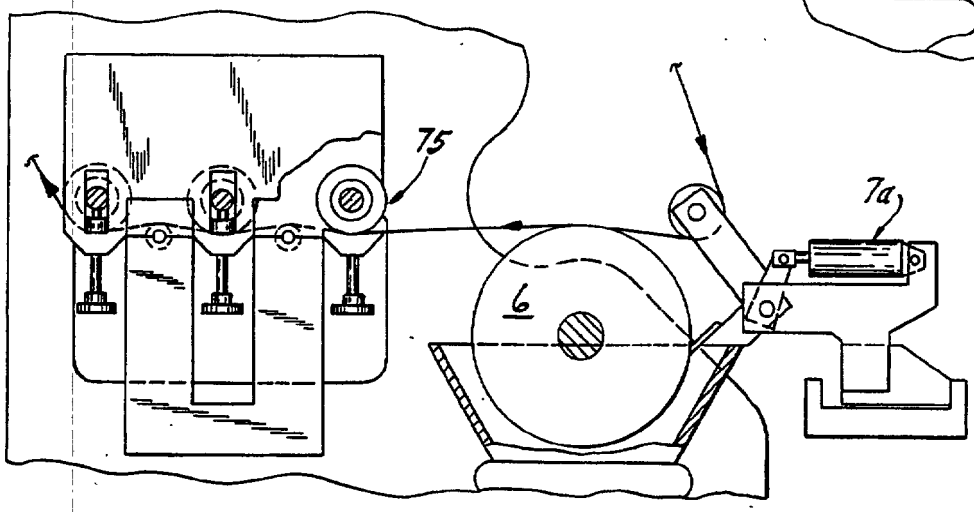


Fig. 9

Fig. 10



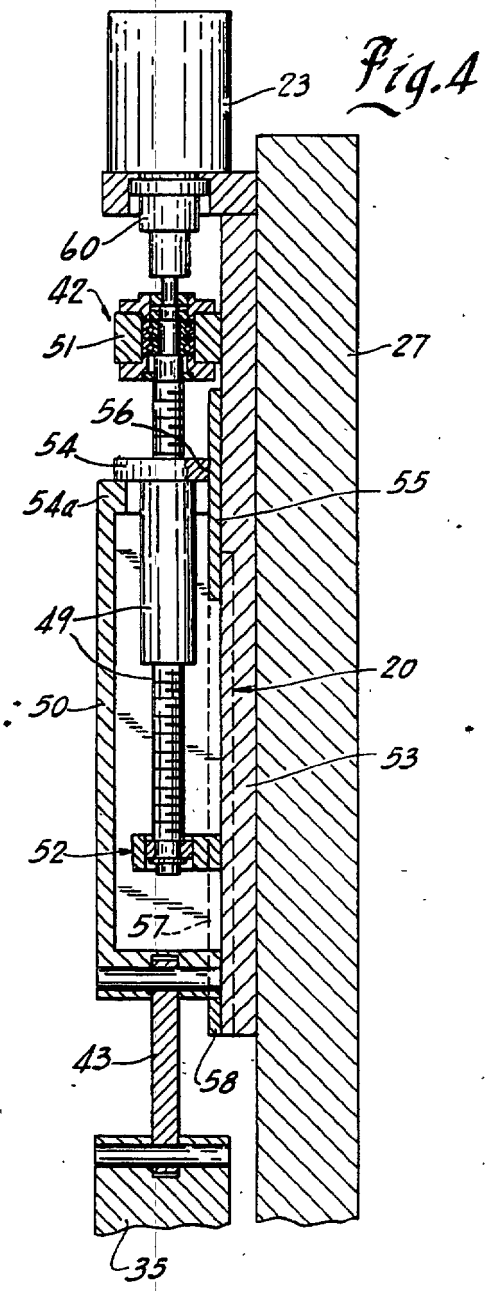


Fig. 4

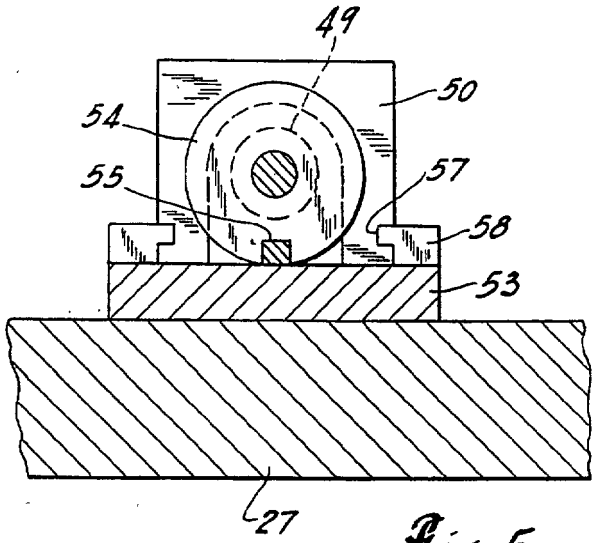


Fig. 5

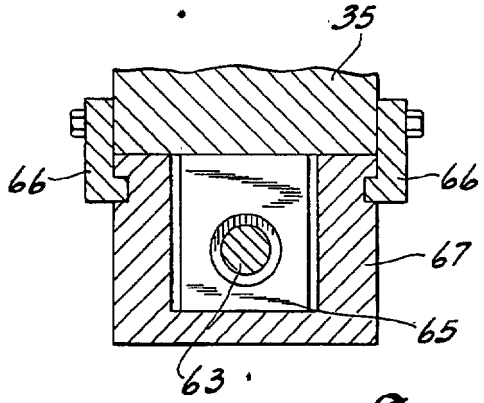


Fig. 7

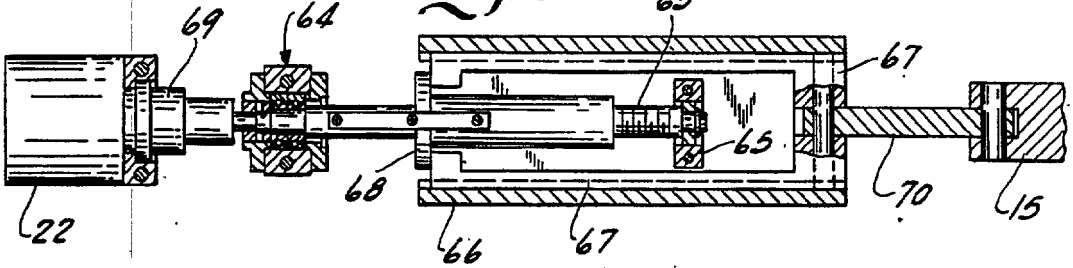


Fig. 6

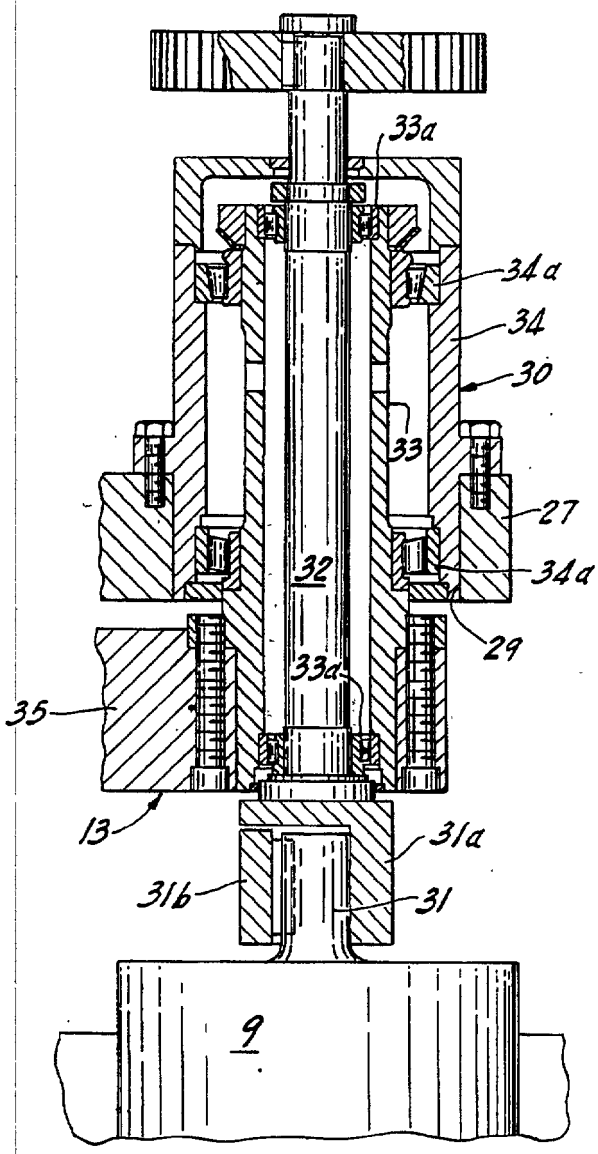


Fig. 8

WEB COATING METHOD AND APPARATUS

BACKGROUND OF THE PRESENT INVENTION

This invention relates to a web coating or printing apparatus and particularly to a web coater for applying a thin film of material onto an elongated web. The invention is also directed to a method of applying a coating based on such apparatus.

Many applications require a web member having a coating applied to one face. The recording and copying fields often use a web or tape like member having a coating on the face thereof. In the manufacture of the coated web, a large roll of the web material is formed for subsequent application of the coating. The web is fed from the roll through a coating apparatus which is specially constructed to deposit a thin film of the coating onto the web, with the coated web subsequently processed such as rewound for subsequent processing into retail sized tapes or other suitable products. The specification for certain products require a uniform coating of constant thickness which in turn requires highly accurate monitoring of the coating process. This is particularly true in those applications where the coating material is a relatively expensive material. For example, a silconecoated web is a typical example where the cost of the silcone coating material is a signficant part of the final product cost. As a result, silicone coating is applied to the web using highly precision formed apparatus such as a gravure coating apparatus. The gravure applicator may use an offset construction or alternatively a direct imprinting construction. The particular method will of course be dictated by the specifications in accordance with well-known procedures. Generally in such applications, the apparatus is set up by the operator to apply a coating of a certain thickness. A piece of the coated web is withdrawn, the coating removed and weighed to determine the accuracy of the application. This provides a reasonably quick determination of the quantity of material being deposited. The thickness of the coating may of course vary substantially from one specification to the next, depending upon the application, the materials of the web and coating and other factors known to those in the art. The apparatus should therefore provide for convenient adjustment of the thickness, preferably with the machine in operation. Finally, with the alternate method of application, a single machine which can be readily converted between an offset construction and a direct gravure construction would be highly desirable for purposes of minimizing the fixed machine cost to the coater company. In both instances of course, the necessary precision construction as well as adjustable features should be maintained in order to provide satisfactory low cost coating of the web.

SUMMARY OF THE INVENTION

The present invention is particularly directed to a coating method and coating apparatus specially constructed to apply a closely regulated and uniform film or layer of material to a web, and particularly such a machine having means for accurate adjustment of the coating. In accordance with the further aspect of the invention, the machine is preferably constructed to permit conversion of the machine for offset and direct gravure coating of the web. Generally in accordance with the teaching of the present invention, the apparatus is constructed with a rigid frame within which an

impression cylinder is mounted in combination with a pivotally mounted offset cylinder and a gravure cylinder. The offset cylinder is mounted in a special dual pivot support assembly for pivotal movement with respect to the impression cylinder and the gravure cylinder. In construction, the offset cylinder is mounted by a pendant pivot means to a pivot support unit or assembly which in turn is pivotally mounted on the axis of the impression cylinder. Similar high pressure adjustment means are separately secured to adjust the pivot support assembly and to the pendant pivot means for adjusting the nip between the offset cylinder and the gravure cylinder and between the impression cylinder and the offset cylinder. Each adjustment means is preferably similarly constructed and includes a high force motive positioning means such as a hydraulic piston/cylinders unit and an adjustable stop which in the optinium construction is a preloaded rotary bearing lead screw positioning mechanism. A stepping motor and harmonic motion reducer are coupled to the lead screw for positioning a stop, which moves the offset cylinder in steps of 5 millionths of an inch. The hydraulic cylinder unit is also secured to the pivot means and to the pivot support unit and provides a continuous force acting against which the lead screw mechanism which operates such that the rotation of the lead screws accurately positions the associated cylinder. The preloaded bearing construction removes all backlash and tolerance movement within the lead screw adjustment and the stepping motor drive accurately and precisely positions the corresponding offset cylinder.

The inventor has discovered that the dual pivot support of the common offset cylinder in combination with the preloaded lead screw adjustment means provides highly accurate positioning and support for the cylinder whereby a coating of uniform thickness is accurately applied to a web moving between the cylinders and wherein the thickness of the coating can be accurately adjusted by the operator.

The positioning drives for the nip adjustment means in another aspect of the invention includes a programmable controller. Suitable sensors such as reflective infrared units are mounted adjacent to the face of the coated web to continuously monitor any change in the web thickness. The signal is sent to the programmable controller to provide automatic adjustment of the position of the cylinder nip adjustment units and thereby the offset cylinder, such as through appropriate stepped movement of the stepping motors, to maintain the preset coating thickness. The operator need only to ensure that in setting up the machine for the coating run that the coating thickness selected is proper. This of course can be readily determined in accordance with the conventional procedure.

More particularly in a preferred construction of the present invention, a heavy rigid frame structure includes two side frame members. The impression cylinder is rotatably mounted in the frame members by high precision bearings. A pivot arm is rotatably mounted on the shaft of the impression cylinder, one at each end of the cylinder. A preloaded lead screw and a power cylinder unit is mounted for each pivot arm extending generally perpendicular to the axis of the impression pivot member and the offset cylinder. The one end of the unit is fixed to the frame structure and the opposite end is secured to the pivot arm pivoted on the impression cylinder shaft. The pivot arms extend upwardly and

outwardly over the impression cylinder. A pivot shaft is rotatably mounted in the pivot arm extended portions. A pair of pendant pivot arms are secured to the pivot shaft and extend downwardly to the offset cylinder. The offset cylinder is rotatably mounted in the lower ends of pivot arms. Preloaded ball bearing lead screw units are coupled one to each of the depending pivot arms and extend substantially perpendicular to the first lead screw unit for positioning the offset cylinder relative to the impression cylinder. The gravure cylinder is mounted in a suitable high precision bearing generally in vertical alignment with the offset cylinder. An appropriate doctor blade unit and the like is secured adjacent the gravure cylinder to apply the coating material to such cylinder for transfer to the web directly, or to the offset cylinder for application to the web as it moves between the offset cylinder and the impression cylinder.

The inventor has discovered that the present invention provides a versatile and highly adaptable dual coating mechanism for coating of web material with a uniform adjustable thickness coating. The present invention is thus particularly adapted to coating of a web with silcone and other highly costly or expensive coating material.

BRIEF DESCRIPTION OF THE DRAWINGS

The drawing furnished herewith illustrates a preferred construction of the present invention in which the above advantages and features are clearly disclosed as well as others which will be readily understood from the following description.

In the drawing,

FIG. 1 is a side view of a coating apparatus, with parts broken away and sectioned to show detail of construction;

FIG. 2 is a top view of the apparatus shown in FIG. 1; and

FIG. 3 is a perspective view of a portion of the apparatus shown in FIGS. 1-2.

FIG. 4. is a sectional view showing a lead screw unit shown in FIGS. 1-3;

FIG. 5. is longitudinal section through a positioning unit shown in FIGS. 1-3;

FIG. 6. is a transverse section of FIG. 5 showing detail of the mounting positioning unit;

FIG. 7. is longitudinal section through another positioning unit similar to FIG. 5;

FIG. 8. is a transverse section of FIG. 7 showing detail of the mounting of the positioning unit;

FIG. 9. is a fragmentary view showing an alternate offset cylinder and gravure cylinder;

FIG. 10. is a view of the apparatus shown in FIG. 1 modified for use as a Mayer roll web processor.

DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

Referring to the drawings and particularly to FIGS. 1 and 2, a printing or coating apparatus 1 is illustrated for applying a coating to a web 2 and particularly to the one surface of the web 2. The apparatus 1 is a rotary press-type construction and the web 2 is withdrawn from a source such as a large roll 3 of the material rotatably supported in an unwind stand. The web 2 is passed over a spreader roll 4 at the input side of the apparatus 1, passes through the apparatus and is discharged over a guide roll, not shown, to a suitable rewind stand or other processing apparatus, not shown. The illustrated apparatus 1 is a gravure applicator including a gravure cylinder 6 rotatably mounted within the apparatus and relative to a fountain unit 7 containing the coating material to be applied to the web 2. Rotation of the gravure cylinder 6 results in the application of the appropriate coating material to the gravure cylinder 6. A doctor blade assembly 7a is associated with the gravure cylinder 6 to remove excess coating material in accordance with conventional practice. The doctor blade assembly 7a may be mounted to the opposite side of the gravure cylinder for coating on the opposite side of the web. An offset cylinder 8 is mounted in opposed relation above cylinder 6 and an impression cylinder 9 is mounted to the outfeed side of the apparatus. The impression cylinder, as shown in FIG. 1, is located to the outfeed side of the offset cylinder and the axis of the impression cylinder is above the axis of the offset cylinder 8. The web 2 is adapted to be passed downwardly from the spreader roll 4 between the impression cylinder 9 and the offset cylinder 8 as shown in phantom in FIG. 1, or alternatively directly between the offset cylinder 8 and the gravure cylinder 6 as shown in full line illustration. This will of course be determined by the particular coating specification. The present invention is particularly directed to the mounting and the positioning mechanism establishing the proper nip setting between the impression cylinder 9 and the offset cylinder 8, and also between the offset cylinder 8 and the gravure cylinder 6. In the illustrated embodiment of the invention, the gravure cylinder 6 and the impression cylinder 9 are rotatably mounted in fixed relation in a suitable frame structure 11. The cylinders 6 and 9 are mounted in fixed relation, and are both constructed and mounted as high quality, precision rotary applicating cylinders. Thus, the cylinders have precisely formed surfaces and mounting shafts which where mounted in high precision bearings establish and maintain precise parallelism and true rotating surfaces. The offset cylinder 8 is similarly constructed and is mounted in a special dual pivot assembly 12 for accurate positioning with respect to the gravure cylinder 6 and the impression cylinder 9. The pivot assembly 12 includes identical assemblies at each end of the offset cylinder 8. Each pivot assembly includes a first pivot arm unit 13 which is pivotably mounted about the axis of the impression cylinder 9, and includes an upper portion 14 extending outwardly over the offset cylinder 8. Depending pivot arms 15 are pivoted to unit 13 and particularly within the outer ends of the upper portion 14. The offset cylinder 8 is rotatably mounted in the lower ends of the pivot arms 15. A first nip power adjustment unit 16 is coupled to the pivot arms 15 and to the adjacent portion of the pivot arm unit 13 for adjusting the nip or spacing of the offset cylinder 8 with respect to the impression cylinder 9. The adjustment unit 16 includes a precision lead screw unit 17 secured to the pivot arm unit 13 and having a pivotal coupling to the lowermost ends of the pivot arms 15. The adjustment unit further includes a power cylinder unit 18 coupled between the pivot arm unit 13 and the pivot arms 15 to force the arm unit against the lead screw unit 17 as a stop to load the arm 15 for insuring high precision movement and placement of the pivot arm unit 13 and thereby the offset cylinder 8 relative to the impression cylinder 9. This provides accurate setting of the nip therebetween.

A second nip power adjustment unit 19 includes a precision lead screw unit 20 and hydraulic power cylinder unit 21 connected between the frame structure 11 and the outer end portion of the first pivot arm unit 13.

The lead screw unit 20 acts as an adjustable stop and positions the offset cylinder 8 with respect to the gravure cylinder 6. Pivoting of the dual pivot assembly 12 about the impression cylinder axis results in a corresponding pivotal movement of the pivot arms 15 for corresponding movement of the offset cylinder.

The lead screw positioning units 17 and 20 may of course be operated in any desired manner. In a particularly practical and unique construction, individual motor units 22–23 are coupled one each to each of the lead screw units 17 and 20. For high precision coatings, motors 22–23 are stepping motors and are referred to for descriptive purposes. The stepping motors 22–23 are constructed and arranged to jointly act with the corresponding lead screw units to establish movements on the order of five millionths of an inch per motor step. The stepping motors in turn may be suitably connected to a programmable controller 24 having suitable manual or automatic input controls for programmed positioning and movement of the offset cylinder 8 with respect to the gravure cylinder 6 and the impression cylinder 9.

The operator thus sets up the coater apparatus 1 for either direct or offset coating. With direct coating the offset cylinder 8 is spaced from the impression cylinder 9 to avoid any interference therebetween, and allow the direct movement and interaction as a result of the movement of the web 2 between the offset cylinder 8 and the gravure cylinder 6. The speed of the gravure cylinder may be operated at match speed and smoothing rolls may be used to smooth out the coatings. The speed of the gravure cylinder may also be operated above match speed to directly smooth out the coatings. In an offset coating mode, the offset cylinder is set to receive the coating from the gravure cylinder and the impression cylnder is set to have the web pass directly between the offset and impression cylinder (as shown in phantom) to transfer the coating to the offset cylinder and then to the web. In either type of coating, the operator will establish the offset of the offset cylinder 8 with respect to the appropriate cylinders to develop and establish a particular coating thickness. The stepping motors 22 and 23 may be separately operated to establish precise parallelism between the cylinder 8 and the cylinders 6 and 9. Then, motors 22 and 23 are operated simutaneously to adjust the nip. An initial trial run is made. Coating material is removed from a known area of the web 3 and weighed to determine the amount of coating being deposited per unit area. The operator can readily determine from this analysis whether or not the apparatus is applying the proper coating thickness. If adjustment is required, the operator merely actuates the programmable controller 24 to appropriately drive the lead screw units 17 and/or 20 for either increasing or decreasing the appropriate nip setting and thereby establish the desired change in thickness. Once the appropriate thickness has been established, the machine operates to continuously deposit the appropriate layer or coating upon the moving web 2.

Suitable thickness sensors 25, such as reflective infrared sensors, may be coupled to the coated web 2 to monitor the thickness of the coating. The sensors 25 are coupled to the controller 24 into a closed loop system for positioning the offset cylinder 8. The sensors 25 determine any variation in the thickness from the preset level and actuate the programmable controller 24 to actuate the proper motor 22–23 and reset the nip to maintain the desired preset thickness. The inventor has found that the dual pivot mounting and support of offset cylinder 8 in combination with the precision positioning units 16 and 19 and the precision quality of the construction and mounting of all cylinders results in a highly accurate and effective means and system for precisely controlling the thickness of the coating with uniform application of the coating. The quality of the products is excellent and relatively inexpensive. The cost factor may be of particular significance where the coating material is a relatively expensive coating material, such as silcone. For example, silcone coatings may require application as low as 0.2 pounds per 3,000 square feet of web.

The coating apparatus may require different basic sizes of a gravure and offset cylinders. The pivot arms 15 may be specially constructed as more fully developed hereinafter to accomodate either of two appropriate sized offset cylinders and related sized gravure cylinders.

More particularly, in the illustrated embodiment of the invention, the rigid frame structure 11 includes heavy machine side frame plates which produce the necessary support of the cylinders to maintain precise location with respect to each other for the degree of accuracy required. The side frame plates 26 and 27 are identically mirrow images and include a substantially rectangular lower base portion within which the gravure cylinder 6 is supported and a projecting top portion on one side of the base portion within which the offset cylinder 8 and the impression cylinder 9, with the pivot assembly 13 are mounted. The web 2 passes down through the exposed upper portion into the cylinders 6–9 and is discharged from between the opposite end of the side frame plates over a guide roll, not shown. The side plates 26–27 are interconnected by suitable spacers to form a rigid support. Appropriate bearing openings 29 are provided adjacent the connection of the upper and lower portions of the frame for receiving of a high precision bearing structure 30 for the impression cylinder 9, as shown in FIG. 8.

The impression cylinder 9 is a conventional cylinder having end shafts 31 constructed as a high quality precision unit which is mounted to a high precision multiple cone bearing unit by a suitable cupped coupling 31*a* having a removable cap 31*b* to a bearing shaft 32 which is rotatably supported in a bearing housing 33 by high precision rotary bearing 33*a* for firmly rotatably supporting of the impression cylinder. The drive for the impression cylinder 9 projects outwardly to the one side of the side frame 26 for coupling to any suitable conventional drive system, not shown. The axis of the impression cylinder 9 is a fixed reference from which the other cylinders are mounted and moved. The suitable bearing structure as shown in FIG. 8 which includes bearing housing 33 rotatably supporting the impression cylinder. In addition, a pivot bearing housing 34 is similarly mounted on the impression cylinder housing 33 by cone bearing 34*a* and bolted or otherwise affixed to frame 27 the pivot assembly 12 coupled to the housing 33.

Referring particularly to FIGS. 2 and 3 pivot arm arm unit 13 of assembly 12 includes a first pivot member 35 which has an opening through which housing 33 passes and to which the arm member 35 is bolted or otherwise secured to support the pivot assembly 12 on the axis of the impression cylinder 9. The pivot arm member 35 is a heavy, rigid arm or plate which projects rearwardly through the upper portion of the frame 11 adjacent frame 27, terminating immediately within the frame structure. The nip adjustment unit 19 is secured

to and supports the outer end of the pivot member 35 and thereby the pivot arm unit 13 in precise location with respect to the impression cylinder 9. The upper edge of the pivot member 35 includes longitudinal recesses 36 on the opposite sides thereof. First and second pivot plates 37 and 38 are bolted or otherwise rigidly and firmly secured in the arm recesses to form an effective integral upper portion of the pivot arms 14 of the pivot arm unit 13.

Each plate 37–38 has a bottom straight edge mating with a recessed edge of the base pivot member 35. The back edge is inclined upperwardly from the base plate member 35 to a top edge which extends outwardly in the direction over the impression cylinder 9. The front edge of the plate 36 includes a relatively straight vertical portion and an outwardly inclined portion. A pivot shaft bracket 39 is welded to the top outer end of the pivot plates 37–38 for receiving a pivot shaft 40 for the offset cylinder 8.

The two pivot plates 37–38 of the pivot assembly 13 are similarly journaled on the pivot shaft 40 by suitable high precision bearing structures 41. The shaft 40 and pivot plates 37–38 are free to pivot relative to each other.

The positioning unit 19 supports the assembly 13 and particular pivot arm members 14 as follows. The lead screw unit 20 is secured to the adjacent frame member 27 by a mounting bearing unit 42 and depends downwardly therefrom. The lower end is coupled to the pivot arm 35 by a pinned link 43. The hydraulic power cylinder unit 21 is fixed to the frame 27 by a pinned connection 45 and to the arm 35 by a pinned connection 46.

More particularly, the hydraulic power cylinder unit 21 is any suitable high quality device adapted to function as a firm reliable force holding the pivot against the adjustment unit and particularly the lead screw unit 20. As shown in FIG. 3, the piston rod terminates in a clevis which is pinned at 46 to an appropriate plate-like portion of the impression cylinder arm 35. The opposite end of the cylinder 21 has a mounting plate 47 which is bolted or otherwise rigidly affixed to the frame 27 with a spacer or other means disposed between the plate 47 and frame 27 to appropriately locate the pivot arm unit 13 on the offset cylinder pivot shaft 40.

The preloaded ball bearing lead screw unit 20 includes lead screw 49 of any high precision construction. A particularly satisfactory unit is manufactured by Warner Electric Brake and Clutch Company of South Beloit, Ill. particularly model no. RP1004A. The preloaded ball bearing lead screw 49 is rotatably mounted within a housing slide 50. The slide 50 is generally a rectangular elongated housing having the one side open or exposed. The screw 49 is rotatably mounted in a pair of spaced bearing housings 51–52 which are secured to a mounting plate 53. The plate 53 is fixed to the frame 27. A follower 54 is threaded on the screw 49 and located adjacent the exterior of the end wall 54*a* through which the screw 49 extends. A coupling key 55 rides in a slot 56 in to the follower 54. The key 55 in turn is secured to the frame plate 53 to prevent turning of the follower. The opposite sides of the slide adjacent to the open end are provided with slide grooves or tracks 57. A pair of track gibs 58 are rigidly affixed to the support to the opposite sides of the slide and mate with the slide grooves 57 to slideably support the slide in relationship to the follower 54 and the movable pivot arm 35. The pivot link 43 is pivotably affixed or pinned to the end of the slide 50 at one end and to the pivot member 35 at the opposite end. The rotation of the lead screw 49 causes the follower 54 to move and thus adjust the stop position of the stop for the slide 50, which moves with a corresponding linear motion of the pivot member 35, which of course moves with a pivotal motion. The bearing supports and the ball screw construction is such that the precision positoning of the pivotal unit 13 results. A harmonic reducer 60 is secured between the outer driven end of the ball screw and the motor to allow the motor 23 to move against the high forces used in the cylinder positioning and nip forces and thus provide accurate positioning by the lead screw and follower 54. The step motor 23 for the unit is preferably of a type which will produce a motion of five millionths of an inch for each step movement of the motor. This of course permits the extremely accurate positoning of the pivotal member 35 and the interconnected offset cylinder shaft 40 with respect to the other cylinders 6 and 9. Where such precision is not required other motive means may be used. For example, synchronous motors have been used. Even manually operated hand wheels or the like may be used to make the adjustments if the accuracy requirements permit. The hand wheel would permit individual adjustment, with suitable releasable coupling to five simultaneous movement.

The offset cylinder pivot arms 15 are pivotedly mounted on the pivot shaft 40. Each arm 15 is mounted on the shaft 40 between the corresponding pivot plates 37–38 by suitable high precision bearings 41. Each arm 15 is a heavy metal plate member having an upper end opening in which the support bearing 41 is locked and the arm depends downwardly from the shaft 40.

The outer edge of the arm 15 is provided with a bearing recess or opening 61*a* for receiving the shaft bearing 61 of the offset cylinder 8. In particular, the bearing unit 61 is secured to the offset cylinder shaft and mates with the recess 61*a* in the depending arms. A bearing cap 62 is bolted or otherwise secured to the arm 15 and secures the bearing within the arm.

The offset cylinder is thus supported in the pair of pivot arms 15 mounted to the opposite ends of the offset cylinder 8 and particularly between the pivot plates of the pivot assembly 13.

The offset-to-impression cylinder nip adjustment unit 16 is mounted to the pivot arm 35 as most clearly shown in FIGS. 1 and 6. The lead screw unit 17 of the unit 16 is constructed in the same manner as unit 20. The lead screw 63 is supported in bearing housings 64 and 65 which are bolted to the underside of arm 35 to rigidly support the lead screw mechanism in position. L-shaped gib members 66 are secured to the side of the impression cylinder pivot arm 35 and mate with the slide tracks in the side of the slide 67 to slideably support the slide for the desired movement.

The follower 68 is in the path of the slide 67 and acts as a stop, and the slide is held against the stop and moves in response to energization of the stepping motor 22 and repositioning of the stop. A harmonic reducer 69 establishes similar step movement. A link 70 pivotably connects the end of slide 67 to the lower end of the arm 15. The arm 15 is thereby firmly held by the power cylinder unit 18 which is pivotably connected to the plates 37–38 and to the arm 15.

The lower end of the offset cylinder arm 15 is shown extended laterally and downwardly from the illustrated cylinder bearing as at 71 to from an alternate bearing connection for a range of small offset cylinders, as

shown in FIG. 9. The lower end of arm 15 is formed with a bearing recess 72 in which a high precision rotary bearing 73 is clamped by a bolted cap 74. The coater otherwise operates in the same manner as the unit shown in FIG. 1.

The apparatus is also particularly adapted to conversion into a mayer roll applicator such as shown in FIG. 10. In this embodiment, the cylinders 8 and 9 are removed and replaced with a Mayer roll unit 75 of a known construction. The gravure cylinder 6 as previously described is mounted in suitable precision bearings to the frames 26 and 27, and is preferably mounted with an other removable bearing cap. The cylinders 8 and 9 are thus conveniently removed by releasing of the respective caps of the impression cylinder coupling 31 and the bearing caps for cylinders 8 and 9.

The present invention particularly through the lead screw unit and power cylinders provide a means to produce precise setting of rotary application.

As used herein, coating refers broadly to the transfer of material to a web by rotating cylinder devices.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particulary pointing out and distinctly claiming the subject matter which is regarded as the invention.

We claim:

1. A coating apparatus, comprising a support means, an impression cylinder rotatably mounted in said support means, a gravure cylinder rotatably mounted in said support means in spaced relation to said impression cylinder, said impression cylinder and said gravure cylinder being located in fixed rotatable positions relative to each other, an offset cylinder mounted between said impression cylinder and said gravure cylinder and adapted to be operatively coupled to said impression cylinder and said gravure cylinder, a dual pivot assembly connected to rotatably support said offset cylinder for positioning said offset cylinder relative to said impression cylinder and said gravure cylinder and including a first pivot means pivotably mounted to the support means and a second pivot means pivotably mounted to said first pivot means, first positioning means coupled to said first pivot means to position said first pivot means and thereby position the second pivot means and said offset cylinder, and second positioning means coupled to said second pivot means to independently and separately position said second pivot means for setting the spacing of the offset cylinder relative to said impression cylinder.

2. The coating apparatus of claim 1 wherein said impression cylinder and said offset cylinder each have a substantially horizontal axis of rotation, said impression cylinder being located to the outfeed side of said offset cylinder and with the axis of the impression cylinder above the axis of said offset cylinder, said gravure cylinder being located beneath said offset cylinder and horizontally and vertically spaced from said impression cylinder, said first pivot means having a pivot axis coincident with the axis of said impression cylinder, and said second pivot means adjusts the spacing of the offset cylinder with respect to said impression cylinder and said first pivot means adjusts the spacing of the offset cylinder with respect to said gravure cylinder.

3. The coating apparatus of claim 2 wherein said first positioning means includes a movable stop member coupled to position the first pivot means and a hydraulic power means to hold the pivot means against said stop member, and said second positioning means includes a movable stop member coupled to position said second pivot means and a hydraulic power means to hold said second pivot means against the corresponding second stop member.

4. A coating apparatus comprising a rigid fixed supporting framework having two side frames adapted to firmly support a rotary applicating mechanism, comprising a pivot arm unit means pivotably secured to said side frames and a depending pivot arm means depending downwardly from said pivot arm unit means, an offset cylinder means having bearing means secured within the lower end of said depending pivot arm means, first and second power positioning units coupled one each to said pivot arm unit means and to said depending pivot arm means, each of said power positioning units including a preloaded ball bearing lead screw unit and a power cylinder, said power positioning units each including stepping motor means coupled to said lead screw units, said first power positioning unit interconnected to said pivot arm unit means and said second power positioning unit interconnected to said depending pivot arm means for moving the offset cylinder means in increments of low millionth's of an inch, an impression cylinder, a gravure cylinder, means mounting said impression cylinder and said gravure cylinder about the offset cylinder in relatively fixed relation to each other whereby said offset cylinder is positioned relative to said fixed relation.

5. The apparatus of claim 4 having a programmable controller coupled to said motor means of said lead screw units and operable to actuate said stepping motors means to correspondingly and precisely move said offset cylinder and thereby operable to control the thickness of the coating applied to the web passing therebetween.

6. The apparatus of claim 5 having sensor means coupled to the coated web to monitor the thickness of said coating and establish a signal proportional thereto, and means connecting said sensor means to said programmable controller.

7. The coating apparatus of claim 4 wherein said pivot arm unit means includes a pivot arm member rotatably supported on the axis of said impression cylinder, said first power positioning unit connected to the framework and to the outer end of the pivot arm member, a pair of spaced pivot plates coupled to the top edge of said pivot arm member and extending upwardly and over the impression cylinder, a pivot shaft mounted in said pivot plates, said depending pivot arm means being mounted on said shaft between said pivot plates, said second power positioning unit including stop means connected to said pivot arm member and to said depending pivot arm means and power moving means connected to said pivot plates and to said depending pivot arm means.

8. The coating apparatus of claim 7 wherein said power positioning units each include a screw unit defining said stop means and a hydraulic cylinder unit.

9. The coating apparatus of claim 8 including a separate drive means for each of said lead screw units, said drive means including a motor and a harmonic motion reducer connected to said motor and to said lead screw unit.

10. A rotary web coater for depositing a thin film of a liquified coating material onto a flexible moving web of base material, comprising a rigid supporting frame structure including a pair of laterally spaced side frames of a plate-like construction, an impression cylinder hav-

ing opposite end shafts rotatably mounted at the opposite ends in said side frames and rigidly supporting said cylinder for rotation on a fixed axis in said side frames, a pivot arm member having a precision bearing mounted on said end shafts of said impression cylinder adjacent said frame, a nip adjustment means mounted to said frame and including a pre-loaded ball bearing lead screw rotatably mounted to said frame and having a follower, a slide housing substantially enclosing said lead screw and including a slide means slidably affixed to said side frames to slidably support the housing on the frame, means interconnecting said slide housing to said lead screw for movement in accordance with the rotation of the lead screw, a pivot link pivotally connected to the lower end of said slide housing and pivotally connected to the outer end of said pivot arm member, a power cylinder unit having a cylinder end pivotally affixed to the frame and having a sliding piston rod aligned with said pivot arm member, a clevis connection connecting the pivot arm member to said piston rod, a stepping motor means coupled to said pre-loaded ball bearing lead screw for accurately positioning said pivot arm member against the position of said cylinder unit, a set of pivot arm member extensions extending upwardly from said pivot arm member and including an upper portion extending outwardly over the impression cylinder, said set of arm member extensions including aligned pivot openings, a pivot shaft extended to said openings and having pivot bearings between the shaft and the arm member extensions to rotatably support the shaft in said arms, a depending pivot arm interposed between said extension arms on said shaft and depending downwardly in front of said impression cylinder and having bearing openings; an offset cylinder having end bearings, means securing said bearings within said bearing opening in said depending arms and rotatably supporting said offset cylinder with its axis of rotation parallel to the axis of rotation of said impression cylinder, a preloaded rotary bearing lead screw mechanism, a slide housing slidably secured to the underside of said pivot arm member, a pre-loaded ball bearing lead screw rotatably journaled in said housing and projecting outwardly beneath the pivot arm member, said lead screw mechanism having a follower on said lead screw coupled to said slide housing as a stop, a pivot leg having one end connected to said housing and the opposite end connected to said depending pivot arm, a power cylinder unit secured to said depending pivot arm and to the pivot arm member extensions defining a high force motor means holding the depending pivot arm against said stop, stepping motor means coupled to said lead screw and operable to rotate said lead screw and move said slide housing in increments of a few millionth's of an inch for each step of the stepping motor means, a gravure cylinder mounted within said frame beneath and in alignment with said offset cylinder, a fountain beneath said gravure cylinder and located for immersing the gravure cylinder in a coating material contained within the fountain, said first lead screw operating to pivot said pivot arm member and thereby adjust the nip between said offset cylinder and said gravure cylinder, said second lead screw being operable to move said depending pivot arm to thereby adjust said offset cylinder with respect to said impression cylinder.

11. The coater of claim **10** wherein said depending pivot arm has a plurality of spaced bearing supporting openings for accommodating different size diameter offset cylinders.

12. The coater of claim **10**, including thickness sensing means coupled to the web to the discharge side of said impression roll and operable to continuously monitor the thickness of coating for variations in the thickness, a programmable controller having pre-set means and input means connected to said sensor means and developing a signal in accordance with variations in said thickness of said coating said programmable controller having an output means connected to said stepping motor means and operable to adjust the lead screw and thereby the nip setting of said offset cylinder to maintain a constant uniform thickness coating on said web.

13. The coater of claim **11**, wherein said bearing openings include first and second pairs of bearing openings spaced from each other in said depending pivot arm, said offset cylinder being removably mounted in said first pair of bearing openings, a second offset cylinder of a substantially smaller diameter than said first named offset cylinder, said second offset cylinder being releasably mounted in said second pair of bearing openings with said first named offset cylinder removed from said first pair of bearing openings, and said gravure cylinder being releasably mounted within said side frames and having means for accommodating a gravure cylinder matched to the offset cylinder.

14. The coater of claim **13**, wherein said gravure cylinder is rotatably mounted in said frame structure, and further comprising a vertically movable support connected to said fountain for varying the vertical position of the fountain.

15. The process of applying a coating by passing of a web through a coating applicator having an impression roll rotatably mounted in a fixed bearing structure and a gravure cylinder rotatably mounted in fixed bearing structure and within a fountain having a coating liquid in combination with an offset cylinder rotatably mounted in a support means mounted in a pivotal support having a pivot axis for pivotal movement of said offset cylinder toward and away from the impression cylinder and having a pivotal mounting means connected to said support means for vertical displacement of said support means with respect to said gravure cylinder, said web being adapted to be passed directly in an offset mode of applying the coating to the web and alternatively passed directly between said offset cylinder and said gravure cylinder in a direct mode of applying the coating to the web, said gravure cylinder transferring said coating from said fountain in both said offset mode and said direct mode, comprising the steps of selectively presetting said support means in a first position locating said offset cylinder with respect to the impression cylinder to establish a selected nip pressure with said web passing between said impression cylinder and offset cylinder and operating in said offset mode, or in a second position spacing said offset cylinder with respect to said impression cylinder by a distance to prevent any interaction therebetween with the web passing between the offset cylinder and gravure cylinder and operating in said direct mode, presetting said pivotal mounting means in a first position to adjust the nip between said offset cylinder and said gravure cylinder to transfer the coating to the offset cylinder in said offset mode and in a second position to adjust said nip to permit passage of the web over the offset cylinder with transfer of the coating from the gravure cylinder to the web in said direct mode, after the selectively presetting of the support means and pivotal mounting means, pass-

ing said web through said apparatus in said direct mode or in said offset mode to receive said coating material, removing a quantity of coating applied to said web from a selected portion of the coated web, weighing the removed web coating to thereby determine a preselected thickness of the coating, manually readjusting the settings of said support means and said pivotal mounting means for any variation in the determined thickness from said preselected thickness and thereby establish a manually set nip setting of the offset cylinder, and thereafter operating said apparatus in an automatic mode with said manually set nip settings to deposit a uniform thickness of said coating material on said web.

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